Canadian Cancer Statistics

2002

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Additional copies may be requested from Divisions of the Canadian Cancer Society or Statistics Canada (see *For Further Information*).

La version française de cette publication est disponible sur demande.

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This monograph was developed by a Steering Committee of the National Cancer Institute of Canada and the Canadian Cancer Society. The Steering Committee includes representatives of the National Cancer Institute of Canada, the Canadian Cancer Society, Health Canada, Statistics Canada, the Canadian Council of Cancer Registries as well as university-based and provincial/territorial cancer agency-based cancer researchers.

The production and distribution of the monograph is the result of collaboration among all these groups.

- The provincial and territorial cancer registries supply and review the cancer incidence data used to produce the statistics in this report. The Committee wishes to acknowledge the essential contribution of the staff at the registries.
- The Surveillance and Risk Assessment Division, Centre for Chronic Disease Prevention and Control (CCDPC), Health Canada, produced the estimates, trends, projections, tables and figures for all sections of the document. Other analyses include producing the probabilities of developing and dying of cancer, calculations of premature mortality, and the contribution of risk factors to cancer. Les Mery of Health Canada contributed to the section on childhood cancer statistics.
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EVALUATION AND ORDER FORMS

Please help us improve this publication. Your feedback on the contents of this report will be used to prepare future editions. It would be helpful for planning if you could complete and return this form by August 31, 2002 to:

Canadian Cancer Statistics
Canadian Cancer Society National Office
10 Alcorn Ave., suite 200
Toronto, Ont.
M4V 3B1

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	Not useful	Somewhat useful	Very useful
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Trends in incidence and mortality	❑	❑	❑
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Probability of developing/dying from cancer	❑	❑	❑
Potential years of life lost due to cancer	❑	❑	❑
Cancer in children and youth aged 0-19 years	❑	❑	❑
Special topics			
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Five-year relative cancer survival in Canada, 1992	❑	❑	❑

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FOR FURTHER INFORMATION

For general information regarding cancer statistics or any other aspect of cancer (such as cancer prevention, screening, diagnosis, treatment and care, etc.), contact the **Canadian Cancer Society's Cancer Information Service at 1-888-939-3333**. A list of the offices of the CCS – the National Office and the Divisional offices – is provided on page **12**. Your local CCS office is listed in the white pages of the telephone directory.

For information regarding cancer research sponsored by the **National Cancer Institute of Canada (NCIC)**, with funds provided by the CCS and The Terry Fox Foundation, contact the NCIC at the address provided on page **12**.

For Information from Health Canada:
More detailed information on methodology is available from the Surveillance and Risk Assessment Division, **Health Canada**, Tunney's Pasture, Ottawa, Ontario, K1A 0L2. Tel. (613) 957-0327, Fax. (613) 941-2057.

Cancer Surveillance On-Line is an interactive, web-based tool for easy access to cancer surveillance data. It allows the user to generate data according to choice of parameters such as cancer site, geographic area, period of time and choice of presentation mode such as tables, charts and maps. See the Health Canada website noted below for the URL.

For Information from Statistics Canada:
Detailed standard tables or custom tabulations are available on a cost recovery basis upon request from the Health Statistics Division, Statistics Canada, National Enquiries Line: 1-800-263-1136; Health Statistics Division: (613) 951-1746. Analytical articles appear regularly in *Health Reports*, Statistics Canada, Catalogue 82-003, quarterly.

For Information from the Provincial Cancer Registries:
Cancer incidence data are supplied to Statistics Canada by **provincial/territorial cancer registries**. Detailed information regarding the statistics for each province or territory is available from the relevant registry. (See pages 10 and 11 for addresses, telephone numbers and fax numbers.)

Data contained in this document are available on the CCS and NCIC websites at (http://www.cancer.ca) or (http://www.ncic.cancer.ca). Additional information is also available from:

- Canadian Cancer Society (CCS)
  http://www.cancer.ca
- National Cancer Institute of Canada (NCIC)
  http://www.ncic.cancer.ca
- Health Canada
  http://www.hc-sc.gc.ca/pphb-dgspsp/dsol-smed/ (select cancer button)
- Statistics Canada
  http://www.statcan.ca
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INTRODUCTION

This monograph is published by the Canadian Cancer Society and the National Cancer Institute of Canada in collaboration with Health Canada, Statistics Canada, provincial/territorial cancer registries as well as university-based and provincial/territorial cancer agency-based researchers. It is part of an annual series that began publication in 1987.

The main purpose of the publication is to provide health professionals, researchers and policy-makers with detailed information regarding the incidence and mortality of the most common types of cancer by age, gender, time period and province or territory. It is hoped that these data will stimulate new research and assist decision-making and priority-setting processes at the individual, community, provincial/territorial and national levels. The monograph is also used by educators, the media and members of the public with an interest in cancer.

Special Topics are included each year and topics from 1997 onwards are available on the Canadian Cancer Society's website (www.cancer.ca); hard copies of previous Special Topics can be obtained by writing to (stats@cancer.ca). This year the Special Topics are (1) Cancer Incidence in Young Adults and (2) Five-year Relative Cancer Survival in Canada, 1992. In past years, other Special Topics included:

- a review of trends in colorectal cancer (2001);
- an overview of progress in cancer control over the past few decades (2000);
- an analysis of the relative impact of population growth and aging on cancer incidence in Canada (1999);
- a review of current directions in cancer surveillance in Canada (1999);
- international comparisons (1998);
- a comparison of cancer in Canada from 1987 to 1997 (1997);
- an evaluation of the accuracy of previously reported estimates (1996);
- detailed reviews of prostate cancer (1996), colorectal cancer (1995) and breast cancer (1993);
- survival rates (1991-1993, 1995);
- prevalence estimates (1995);
- smoking prevalence and lung cancer (1991);
- cancer in Aboriginal populations (1991);
- age-specific trends among women (1990);
- cancer rates by income level (1990); and
- the economic burden of cancer (1990, 1996).

Information on cancer incidence and mortality comes from the provincial and territorial cancer registries and offices of vital statistics, which send their data to Statistics Canada for compilation at the national level. The process of collecting complete information about cancer cases in each province and then compiling this information at the national level results in a considerable delay before reliable information for a particular year is available for all of Canada. This report contains actual rates and frequencies up to the most recent year for which complete data are available (1998 for both incidence and mortality) and, in addition, estimated values for the years up to 2002. The estimates are made in the following way: first, time trends in the known rates are examined; second, these trends are projected to the present time to obtain current rate estimates; and third, these rate estimates for the current year are applied to current population estimates.

INTRODUCTION

The statistical methodology used for publication in recent years involves the standardization of incidence and mortality rates on the basis of the 1991 Canadian population rather than the World Standard Population. Age-standardized rates are higher with this methodology because the Canadian population has a higher proportion of older people, among whom cancer is more common. Standardization using the Canadian population provides results that are more relevant and useful to those concerned with cancer in Canada. **It should be noted that it is not appropriate to compare the age-standardized rates presented here with those from publications that employ a different standard population.**

Details of the statistical methods used to produce the projections are described in *Appendix II: Methods*. **It is important to emphasize that the figures provided for 1999-2002 are estimates, rather than actual data.**

The statistics contained herein refer to all types of cancer, defined according to the standardized classification that is used worldwide. As is customary in reports from cancer registries, the statistics exclude skin cancers other than melanoma. Benign tumours and carcinoma in situ are also excluded. Details of how cancer sites are classified and definitions of technical terms are provided in the *Glossary*.

Individuals who require additional information can refer to the section entitled *For Further Information*, which indicates how to contact the various agencies involved, including Health Canada, Statistics Canada, the Canadian Cancer Society, the National Cancer Institute of Canada, and provincial and territorial cancer registries. Related information can also be found in other publications, including reports from provincial and territorial cancer registries; Cancer Incidence in Canada, 1969-1993,[1] and Health Reports, published by Statistics Canada; Chronic Diseases in Canada and the Canadian Cancer Incidence Atlas,[2] published by Health Canada; a collaborative monograph entitled The Making of the Canadian Cancer Registry; Cancer Incidence in North America,[3] published by the North American Association of Central Cancer Registries; and Cancer Incidence in Five Continents,[4] published by the International Agency for Research on Cancer.

The development of this publication over the years has benefited considerably from the comments and suggestions of readers. **The Steering Committee appreciates and welcomes such comments, including ideas on how the report can be improved** (an *Order and Evaluation Form* is included on pages 7 and 8). Finally, **readers can be included on the mailing list for next year's publication** by completing the *Order and Evaluation Form*.

Current Incidence and Mortality

An estimated 136,900 new cases of cancer and 66,200 deaths from cancer will occur in Canada in 2002.

In 2002 the most frequently diagnosed cancers will continue to be breast cancer for women and prostate cancer for men.

Lung cancer remains the leading cause of cancer death for both genders. Almost one-third of the cancer deaths in men and one-quarter in women are due to lung cancer alone.

Trends in Incidence and Mortality

Among men the cancer mortality rate for all cancers combined has declined by 12% since 1988 as a result of decreases in mortality rates for lung, colorectal, and certain other cancers.

Since 1974, among women, there has been a 20% decline in mortality rates for all cancers combined exclusive of lung cancer.

Among Canadian men, prostate cancer will continue to be the most frequently occurring cancer in 2002. Beginning in 1994 incidence rates for prostate cancer began to decline after having increased rapidly for several years. Mortality rates for prostate cancer peaked between 1991 and 1995 and have fallen since. Increases in prostate cancer incidence in the early 1990s were likely due to the rapid increase in the use of early detection techniques (such as measurement of Prostate Specific Antigen levels).

Following several decades of rapid increase, the rate of increase of lung cancer incidence and mortality rates among women began to level off in 1993 reflecting a decline in smoking rates among women that began in the mid-1970s. However, they remain roughly four times as high as rates in 1973 and are only about half as high as rates among men.

Following small but steady annual increases over three decades, breast cancer incidence among women leveled off in 1993. Mortality rates for breast cancer have declined steadily since 1986. This pattern of divergent trends is consistent with the benefits being achieved through screening programs and improved treatments.

For colorectal cancer, the third most common cancer for both men and women, both incidence and mortality rates have declined steadily over the past decade and a half. The rate of decline is more pronounced among women with a 21% drop in incidence rates and a 30% drop in mortality rates.

Non-Hodgkin's Lymphoma is the fifth most common cancer for both men and women. Incidence rates among both have doubled since 1973. Mortality rates have also increased but more slowly. The increasing incidence trend is most pronounced among young adults.

Thyroid cancer is a relatively rare disease, which in the past decade has had the most rapidly increasing incidence rate among both men and women, in particular among young adults. The rate of increase has been less pronounced among men; mortality rates have been relatively stable.

Incidence and mortality rates for Hodgkin's disease have declined significantly among males, whereas the decline in incidence was much less pronounced among females. Stomach cancer rates have been dropping steadily among both males and females.

Age and Gender Distribution of Cancer

Cancer is primarily a disease of older Canadians, particularly for men. Among men, 74% of new cancer cases and 83% of deaths due to cancer occur among those who are at least 60 years old. Among women, 63% of new cases and 79% of cancer deaths occur among those who are at least 60 years old.

After age 69, the rate at which men die from cancer is higher than the rate at which women develop cancer.

Probability of Developing/Dying from Cancer

Based on current incidence rates, during their lifetimes, 38% of women will develop cancer. One in 9 women are expected to develop breast cancer, 1 in 16 will develop colorectal cancer, and 1 in 18 will develop lung cancer.

Among men, 41% will develop cancer during their lifetimes. One in 8 will develop prostate cancer during their lifetime, mostly after age 70, 2 in 23 will develop lung cancer and 1 in 15 will develop colorectal cancer.

The probability of developing cancer is lower for younger people. Over the next 10 years the probability of a 30-year old woman developing breast cancer is 1 in 250 and for a 70-year old woman it is 1 in 30. The probability of developing prostate cancer during the next decade among 30-year old men is essentially zero and among 70-year-old men is 1 in 16.

Potential Years of Life Lost Due to Cancer

Cancer is the leading cause of premature death in Canada, being responsible for almost 30% of all potential years of life lost.

Because of its relative frequency and poor survival rates, lung cancer is by far the leading cause of premature death due to cancer.

Smoking is responsible for about one-third of potential years of life lost (PYLL) due to cancer, about one-quarter of PYLL due to diseases of the heart and about one-half of PYLL due to respiratory disease.

Cancer in Children Aged 0-19 Years

In recent years (1994-1998), cancer was diagnosed, on average, in 1,262 Canadian children, of whom an average of 239 died each year. The most common childhood cancer is leukemia, which accounts for over 26% of new cases and 32% of deaths.

Special Topics

Cancer Incidence in Young Adults

In young adults there have been 65% more cancer cases in females than in males, primarily due to cancers of the reproductive system. There are significantly increasing incidence trends for Non-Hodgkin's lymphoma and thyroid cancer in both sexes, and lung cancer in females.

Five-year Relative Cancer Survival in Canada, 1992

In 1992, the overall age-standardized five-year relative survival rate for prostate cancer was 87%, and for breast cancer it was 82%. For colorectal cancer the rates were 59% and 56% among women and men respectively, and for lung cancer they were 17% and 14% among women and men respectively.

The importance of different forms of cancer in Canada in 2002 can be measured in three ways, shown in Table 1. Incidence is expressed as the number of new cases of a given type of cancer diagnosed per year. Mortality is expressed as the number of deaths attributed to a particular type of cancer during the year. The deaths to cases ratio (the number of deaths divided by the number of new cases) is a crude indicator of disease severity. The closer a value is to 1.0, the poorer the prognosis for that cancer. Frequencies listed in Tables 1 to 6 are estimates based on modelling trends in cancer and population data since 1986 for both cancer incidence and mortality (an exception was made for prostate cancer; see *Appendix II* for details). These estimates are rounded to the nearest 5, 10, 50 or 100. Readers requiring actual data or information on less common sites of cancer may refer to Tables 1 and 2 in *Appendix I* or to source publications.[1,4]

Some problems that may be inherent in using these statistics are considered below.

Sources of Data

Incidence figures collected by provincial and territorial cancer registries are reported to the Canadian Cancer Registry (CCR) maintained by Statistics Canada, beginning with cases diagnosed in 1992. The patient-oriented CCR has evolved from the event-oriented National Cancer Incidence Reporting System, which collected data from 1969-1991. The new CCR is regularly updated, it is internally linked to track patients with tumours diagnosed in more than one province, and its records are linked to death certificates. Data from these series are published by Statistics Canada,[1] the North American Association of Central Cancer Registries,[3] every five years by the International Agency for Research on Cancer,[4] and in occasional reports.[1,2]

Every effort is made to count all newly diagnosed cases of cancer among people who reside in a given province at the time of diagnosis, and to accurately and consistently record for each case the site and histological type of cancer from pathology reports and other records, according to definitions in the CCR Data Dictionary. Cancer sites included in this report are defined according to the groupings listed in the *Glossary*. Although the provincial/territorial cancer registries strive, through the Canadian Council of Cancer Registries and its Standing Committee on Data Quality, to achieve uniformity in defining and classifying new cases, reporting procedures may still vary across the country. This is particularly true for skin cancer (other than melanoma), which occurs frequently but is difficult to register completely because it is usually treated successfully without requiring hospitalization or the review of a pathologic specimen. **For this reason, all tables in this monograph exclude the estimated 72,000 cases of non-melanoma skin cancer for Canada in 2002.*** Registration levels for cancer have become more comparable across the country, particularly in the period between 1981 and the mid-1980s, as registries standardized their procedures for case-finding, including linkage to provincial mortality data files.

Cancer mortality statistics are derived from death records maintained by the provincial and territorial registrars of vital statistics for persons residing in that province or territory at the time of death. Cancer deaths are those attributed to some form of cancer as the underlying cause of death by the certifying physician.

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* *The number of new cases of non-melanoma skin cancer is estimated using incidence rates from the cancer registry in British Columbia, which is considered to have the most complete data. Please refer to Appendix II: Methods for further details.*

Although these procedures have been standardized both nationally and internationally, some lack of uniformity is inevitable. The description of the type of cancer provided on the death certificate is usually less precise than that obtained by the cancer registries from hospital and pathology records. Also, cancer deaths occurring in a given year will usually be the result of cancers diagnosed in previous years.

Estimates for Cancer Incidence and Mortality, Canada, 2002

An estimated 136,900 new cases of cancer and 66,200 deaths from cancer will occur in Canada in 2002. Men outnumber women for both new cases and deaths, by 3.9% for incidence and 12.9% for mortality (Table 1).

Three types of cancer account for at least 50% of the new cases in each sex: prostate, lung, and colorectal cancers in males, and breast, lung, and colorectal cancers in females. Thirty percent of the cancer deaths in men and one-quarter in women are due to lung cancer alone (Figures 1.1 and 1.2).

Lung cancer will continue as the leading cause of cancer death among Canadian women in 2002, accounting for an estimated 7,700 deaths, as compared with the 5,400 deaths expected for breast cancer. This reflects the rapid increase in lung cancer mortality rates among women over the past 3 decades, while age-standardized breast cancer mortality rates declined slightly. Lung cancer incidence among women also continues to rise. With an estimated 8,800 new cases, lung cancer is the second leading form of cancer in women, ahead of the 8,100 new cases expected for colorectal cancer, which ranks third. Breast cancer continues to lead in incidence among Canadian women, with more than twice as many new cases as lung cancer.

Among Canadian men in 2002, prostate cancer will continue as the leading form of cancer diagnosed, with an estimated 18,200 newly diagnosed cases, as compared with 12,000 lung cancers. The rapid increase in the number of prostate cancers detected in all provinces in the early 1990s resulted from the widespread rise in the use of earlier detection techniques. The projected number of new prostate cancer cases was derived from a Poisson regression model using data from 1991 to the most recent year of incidence data available (see *Appendix II: Methods*).

Lung cancer will remain the leading cause of cancer death among Canadian men in 2002; the estimated 10,700 lung cancer deaths far exceed the 4,300 deaths due to prostate cancer, the second leading cause of cancer death in men.

Deaths to Cases Ratio

The ratio of deaths to new cases, at 48% overall, is slightly higher in males than in females. On the basis of these ratios, the cancer sites listed in Table 1 could be classified arbitrarily into three groups: those with a very good prognosis (a ratio of 30% or less — breast, prostate, melanoma, body of the uterus, thyroid, cervix, Hodgkin's disease, testis, and male bladder); those with a fairly good prognosis (a ratio greater than 30% but less than 50% — colorectal, non-Hodgkin's lymphoma, female bladder, kidney, oral and larynx); and those with a poor prognosis (ratio greater than 50% — lung, adult leukemia, pancreas, stomach, ovary, brain, multiple myeloma and esophagus).

Table 1
Estimated New Cases and Deaths for Cancer Sites by Gender, Canada, 2002

	New Cases 2002 Estimates			Deaths 2002 Estimates			Deaths/Cases Ratio 2002 Estimates		
	Total	M	F	Total	M	F	Total	M	F
All Cancers	**136,900**	**69,800**	**67,200**	**66,200**	**35,100**	**31,100**	**0.48**	**0.50**	**0.46**
Lung	20,800	12,000	8,800	18,400	10,700	7,700	0.88	0.89	0.87
Breast	20,700	140	20,500	5,400	40	5,400	0.26	0.30	0.26
Prostate	18,200	18,200	–	4,300	4,300	–	0.24	0.24	–
Colorectal	17,600	9,500	8,100	6,600	3,500	3,000	0.37	0.37	0.37
Non-Hodgkin's Lymphoma	6,300	3,400	2,900	2,800	1,500	1,300	0.45	0.44	0.46
Bladder	5,000	3,700	1,300	1,500	1,050	470	0.30	0.28	0.36
Kidney	4,000	2,500	1,500	1,450	910	560	0.36	0.36	0.37
Melanoma	3,900	2,000	1,850	840	510	330	0.22	0.25	0.18
Leukemia	3,600	2,100	1,550	2,200	1,250	940	0.60	0.60	0.61
Body of Uterus	3,600	–	3,600	680	–	680	0.19	–	0.19
Pancreas	3,200	1,550	1,700	3,200	1,500	1,700	0.99	0.98	0.99
Oral	3,100	2,100	980	1,050	720	340	0.35	0.35	0.35
Stomach	2,800	1,800	1,000	1,950	1,200	760	0.70	0.67	0.75
Ovary	2,500	–	2,500	1,550	–	1,550	0.62	–	0.62
Brain	2,400	1,350	1,100	1,600	910	680	0.66	0.68	0.64
Thyroid	1,950	480	1,450	180	65	120	0.09	0.13	0.08
Multiple Myeloma	1,850	1,000	830	1,250	690	560	0.68	0.69	0.68
Cervix	1,400	–	1,400	410	–	410	0.30	–	0.30
Esophagus	1,350	980	400	1,500	1,100	400	1.11[1]	1.15[1]	1.01[1]
Larynx	1,200	970	230	500	420	85	0.42	0.43	0.36
Testis	790	790	–	40	40	–	0.05	0.05	–
Hodgkin's Disease	780	440	350	110	65	50	0.15	0.15	0.15
All Other Sites	10,000	4,900	5,100	8,700	4,600	4,100	0.86	0.93	0.80

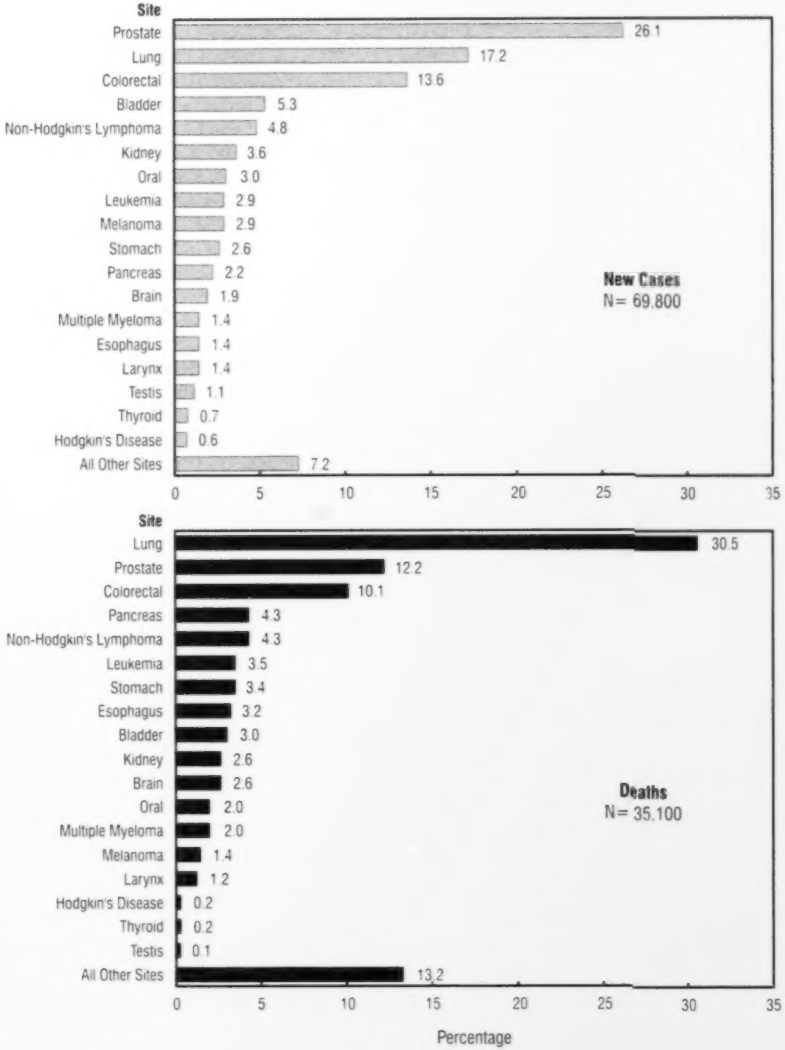
– Not applicable

[1] The high ratio (in excess of 1.0) for cancer of the esophagus may result from incomplete registration of this cancer before death. Please refer to *Appendix II: Methods* for further details.

Note: Incidence figures exclude an estimated 72,000 new cases of non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

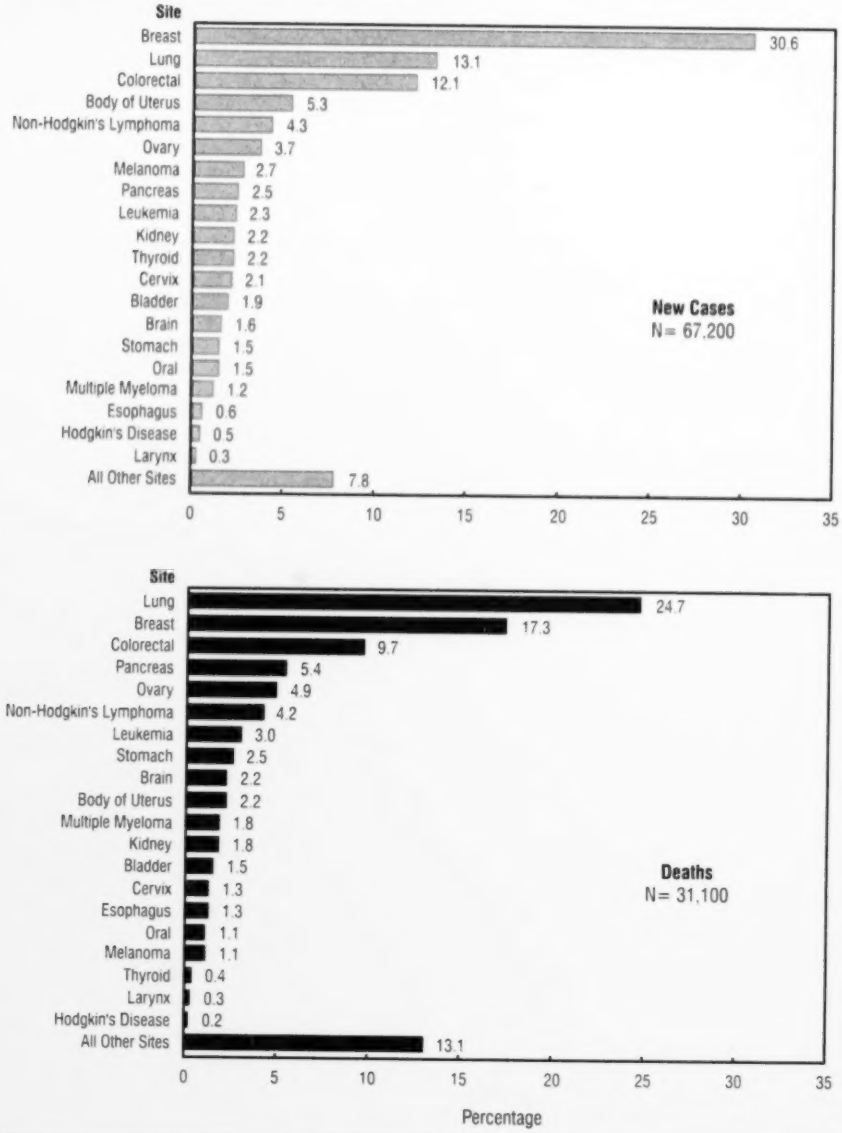
Figure 1.1
Percentage Distribution of Estimated New Cases and Deaths for Selected Cancer Sites, Males, Canada, 2002



Note: Incidence figures exclude an estimated 72,000 new cases of non-melanoma skin cancer (ICD-9 173).
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 1.2

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancer Sites, Females, Canada, 2002



Note: Incidence figures exclude an estimated 72,000 new cases of non-melanoma skin cancer (ICD-9 173).
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

GEOGRAPHIC PATTERNS OF CANCER OCCURRENCE

Table 2 presents population projections and estimates of new cases and deaths for all cancer sites combined, by gender and province or territory for 2002. Tables 3 and 4 present estimates of the number of new cases and the age-standardized incidence rates for each of the major cancer sites, by gender and province for 2002. The age-standardized estimates take into consideration the differences in provincial age distributions, thus facilitating inter-provincial comparisons. Similarly, Tables 5 and 6 present estimates of the number of deaths and the age-standardized mortality rates for each of the major cancer sites, by gender and province for 2002. The calculation of standardized rates using the 1991 Canadian population as the standard is described in the *Glossary*. Adjustments were necessary for estimated incident cases in most provinces; however, these adjustments were not made in the age-standardized rates, which are modelled independently, as described in *Appendix II: Methods*.

Tables 3 to 6 in *Appendix I* provide the most recent actual data across the provinces. This is a new feature initiated in 2001.

Data on provincial numbers and rates of incident cancer cases and cancer deaths provide valuable information for research, knowledge synthesis, planning and decision-making at the provincial/territorial level. These data are therefore of interest to researchers, health care workers, planners and policy-makers. Inevitably, these data will be used for inter-provincial comparisons. While the incidence rates for some cancers (e.g. breast) appear to be consistent across jurisdictions, the rates for others (e.g. prostate) appear to vary more widely. Interpretation of these variations must be done with caution, however, because a variety of reasons could account for the observations.

First, if the cancer is rare, the number of cases occurring annually in a given province may be so small that estimates may be unreliable. Second, correlations found between the incidence of disease and the prevalence of risk factors for a given geographic location can be misleading. Proof of a causal association between a risk factor and a disease requires more detailed studies of individuals. However, different patterns of tobacco consumption among the provinces contribute to some of the variation.

Third, for many cancers there is a long interval between exposure to a risk factor and the occurrence of disease, and often the information on the prevalence of risk factors from previous decades is inadequate. Lower socio-economic status has been associated with higher cancer mortality and increased incidence of certain cancers (e.g. cervical) but decreased incidence of others.

Fourth, the availability of and the completeness in target populations of screening programs (e.g. for breast and cervical cancer) differ among provinces. The year of initiation of screening programs differs by province, and cancer rates will be altered temporarily through identification of previously undiagnosed cases in asymptomatic individuals. As well, the availability of diagnostic procedures may differ regionally.

Finally, there are differences in the reporting procedures used in cancer registration (e.g. registration of second primary cancers and use of death certificates – see *Appendix II* regarding cancer registry methodology). For example, death certificate information has not been available for registry purposes in Newfoundland until now, which would falsely lower the number of incident cases with short life expectancy such as lung and pancreatic cancer. The degree to which death certificate information is actively followed back to hospital records also varies in different provinces, which affects the accuracy of incident data.

GEOGRAPHIC PATTERNS OF CANCER OCCURRENCE

Even with these cautions, it should be noted that Canada is one of the few nations where cancer patterns can be monitored for the whole population. The provincial and national cancer registries are important resources for making comparisons that generate hypotheses warranting further investigation. Where true differences in cancer risk and causal associations are demonstrated in subsequent epidemiologic studies, these findings can be used in planning cancer control programs that aim to reduce the burden of cancer.

Table 2

Estimated Population, New Cases and Deaths for All Cancers by Gender and Geographic Region, Canada, 2002

	Population (000s) 2002 Estimates[1]			New Cases 2002 Estimates[2]			Deaths 2002 Estimates		
	Total	M	F	Total	M	F	Total	M	F
Canada	**31,260**	**15,478**	**15,782**	**136,900**	**69,800**	**67,200**	**66,200**	**35,100**	**31,100**
Newfoundland	535	265	270	1,900	990	920	1,250	700	530
Prince Edward Island	140	69	71	670	360	310	330	180	150
Nova Scotia	945	464	481	4,900	2,600	2,300	2,500	1,300	1,200
New Brunswick	758	375	383	3,800	2,000	1,800	1,850	1,000	830
Quebec	7,408	3,655	3,753	34,000	16,900	17,100	17,900	9,600	8,300
Ontario	11,963	5,904	6,059	52,400	26,700	25,700	24,000	12,600	11,400
Manitoba	1,152	572	580	5,400	2,700	2,600	2,600	1,350	1,300
Saskatchewan	1,026	510	516	4,600	2,400	2,100	2,300	1,250	1,050
Alberta	3,060	1,544	1,516	11,500	5,900	5,600	5,000	2,700	2,400
British Columbia	4,171	2,067	2,104	17,700	9,200	8,500	8,300	4,400	3,900
Yukon	31	16	15	85	40	50	45	20	25
Northwest Territories	43	22	21	95	50	40	40	20	20
Nunavut	29	15	14	50	25	25	30	20	15

[1] 2002 population projections were provided by the Census and Demographics Branch, Statistics Canada.
[2] Figures exclude non-melanoma skin cancer (ICD-9 173).
Note: Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods*.
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 3
Estimated New Cases for Major Cancer Sites by Gender and Province, Canada, 2002

	New Cases										
	Canada*	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**69,800**	**990**	**360**	**2,600**	**2,000**	**16,900**	**26,700**	**2,700**	**2,400**	**5,900**	**9,200**
Prostate	18,200	260	100	720	590	2,900	7,600	730	690	1,850	2,700
Lung	12,000	140	65	480	390	3,900	4,000	440	350	860	1,350
Colorectal	9,500	210	50	340	250	2,400	3,500	400	320	760	1,200
Bladder	3,700	50	15	170	120	1,350	1,100	160	160	200	370
Non-Hodgkin's Lymphoma	3,400	40	20	120	90	840	1,300	130	110	280	450
Kidney	2,500	40	20	95	75	600	1,000	110	75	230	280
Oral	2,100	50	10	70	45	510	790	100	70	170	250
Leukemia	2,100	20	10	50	60	490	800	75	100	210	230
Melanoma	2,000	15	15	100	55	280	840	70	65	240	340
Stomach	1,800	55	10	55	55	460	660	70	60	140	220
Pancreas	1,550	15	10	50	55	430	520	65	50	130	220
Brain	1,350	25	5	40	35	370	500	45	45	110	170
Multiple Myeloma	1,000	15	5	35	25	270	400	40	25	65	130
Larynx	970	15	5	30	30	330	340	30	30	60	110
Females											
All Cancers	**67,200**	**920**	**310**	**2,300**	**1,800**	**17,100**	**25,700**	**2,600**	**2,100**	**5,600**	**8,500**
Breast	20,500	320	90	690	550	5,200	7,800	810	630	1,750	2,700
Lung	8,800	85	50	370	280	2,100	3,300	330	280	720	1,250
Colorectal	8,100	160	50	330	240	2,100	3,100	330	270	570	980
Body of Uterus	3,600	55	15	120	85	830	1,400	170	110	340	450
Non-Hodgkin's Lymphoma	2,900	35	10	95	85	710	1,150	120	95	230	360
Ovary	2,500	25	10	80	45	700	1,000	85	80	160	290
Melanoma	1,850	20	20	90	70	270	750	60	65	230	260
Pancreas	1,700	10	10	65	50	470	600	65	50	150	220
Leukemia	1,550	15	5	40	35	370	640	70	65	130	170
Kidney	1,500	20	10	60	50	380	570	60	60	140	160
Thyroid	1,450	20	5	30	25	360	610	55	40	150	160
Cervix	1,400	30	10	50	35	280	560	55	50	140	190
Bladder	1,300	15	5	65	40	460	390	55	55	75	120
Brain	1,100	10	5	30	25	310	410	40	35	85	120
Stomach	1,000	30	–	30	25	290	370	35	40	80	120
Oral	980	10	5	30	20	220	390	45	35	75	140
Multiple Myeloma	830	10	5	20	20	230	340	35	30	50	100

– Fewer than 3 cases

* Canada totals include provincial and territorial estimates. However, territories are not listed separately due to small numbers.

Note: Total of rounded numbers may not equal rounded total number. The Canada and provincial totals for all cancers exclude an estimated 72,000 cases of non-melanoma skin cancer (ICD-9 173). Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2002 estimates are compared to previously published estimates. These estimates may vary from actual figures. Please see *Appendix I* for most current actual data or contact provincial cancer registries for further information.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 4
Estimated Age-Standardized Incidence Rates for Major Cancer Sites by Gender and Province, Canada, 2002

	Rate per 100,000										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**442**	**350**	**470**	**514**	**513**	**479**	**423**	**477**	**430**	**407**	**456**
Prostate	120	95	135	146	148	75	126	123	124	139	121
Lung	74	46	88	95	98	100	64	72	62	64	59
Colorectal	59	73	68	67	62	61	58	66	56	57	54
Bladder	22	19	19	33	29	35	18	26	26	15	16
Non-Hodgkin's Lymphoma	21	13	20	22	21	21	21	21	19	19	20
Kidney	16	14	23	18	18	16	16	18	13	15	12
Leukemia	13	6	12	10	14	13	13	12	17	15	11
Oral	12	18	16	13	11	12	12	16	11	11	10
Melanoma	12	5	17	19	14	7	13	11	11	15	14
Stomach	11	19	13	10	12	12	10	11	9	10	10
Pancreas	9	5	14	9	13	11	8	10	8	9	10
Brain	8	8	5	8	8	9	8	8	8	7	8
Larynx	6	7	7	5	6	8	5	5	5	4	4
Multiple Myeloma	6	4	8	7	5	7	7	7	4	4	6
Females											
All Cancers	**347**	**280**	**356**	**379**	**365**	**351**	**350**	**367**	**329**	**347**	**323**
Breast	106	94	107	112	110	107	106	114	98	108	102
Lung	47	25	56	56	53	43	44	47	41	45	46
Colorectal	39	47	54	49	45	40	40	42	38	35	35
Body of Uterus	19	18	15	20	17	17	19	24	18	21	18
Non-Hodgkin's Lymphoma	15	11	12	15	17	15	15	17	14	14	14
Ovary	13	8	13	13	10	15	14	12	12	9	11
Melanoma	10	7	19	14	13	6	10	9	10	14	10
Thyroid	10	5	2	6	6	8	10	9	8	9	7
Pancreas	8	3	7	9	9	9	8	7	6	9	8
Cervix	8	10	13	9	8	6	8	9	10	8	8
Kidney	8	7	10	10	10	8	8	8	9	8	6
Leukemia	8	5	5	6	7	8	9	9	9	8	7
Bladder	6	4	3	9	8	9	5	7	8	4	4
Brain	6	3	4	5	6	7	6	6	6	5	5
Oral	5	4	4	5	4	5	5	6	4	5	5
Stomach	5	7	3	4	4	5	5	3	5	5	4
Multiple Myeloma	4	2	4	3	4	4	4	4	4	3	4

[1] Canada totals include provincial and territorial estimates. However, territories are not listed separately due to small numbers.

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are adjusted to the age distribution of the 1991 Canadian population. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2002 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 5
Estimated Deaths for Major Cancer Sites by Gender and Province, Canada, 2002

	Deaths										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**35,100**	**700**	**180**	**1,300**	**1,000**	**9,600**	**12,600**	**1,350**	**1,250**	**2,700**	**4,400**
Lung	10,700	230	55	420	350	3,600	3,400	370	320	720	1,200
Prostate	4,300	80	25	170	140	880	1,600	180	250	410	530
Colorectal	3,500	65	15	95	70	1,150	1,250	140	130	250	350
Pancreas	1,500	25	10	55	50	390	540	55	55	130	200
Non-Hodgkin's Lymphoma	1,500	15	10	70	45	320	570	80	55	110	200
Leukemia	1,250	15	5	30	25	290	500	50	50	110	160
Stomach	1,200	50	5	40	30	360	390	55	40	95	140
Bladder	1,050	25	5	40	25	260	370	45	50	85	140
Brain	910	20	5	30	25	280	290	35	35	75	120
Kidney	910	20	5	40	35	240	300	45	30	70	110
Oral	720	15	5	30	20	210	250	30	15	45	90
Multiple Myeloma	690	10	5	35	20	170	260	30	25	45	100
Melanoma	510	5	5	25	15	90	220	20	15	45	70
Larynx	420	5	–	20	15	150	130	10	15	20	45
Females											
All Cancers	**31,100**	**530**	**150**	**1,200**	**830**	**8,300**	**11,400**	**1,300**	**1,050**	**2,400**	**3,900**
Lung	7,700	110	50	300	160	2,200	2,700	260	260	580	1,100
Breast	5,400	100	25	200	150	1,450	2,000	210	160	420	640
Colorectal	3,000	50	15	110	75	1,050	1,050	130	90	160	320
Pancreas	1,700	25	10	65	55	420	600	65	70	150	220
Ovary	1,550	30	5	50	35	360	580	65	65	130	210
Non-Hodgkin's Lymphoma	1,300	15	10	60	40	280	530	75	55	85	170
Leukemia	940	15	5	35	25	210	370	40	45	75	120
Stomach	760	30	–	25	20	240	240	25	30	70	80
Body of Uterus	680	10	5	35	15	180	250	30	15	55	75
Brain	680	10	5	25	20	220	220	25	20	55	85
Multiple Myeloma	560	15	–	20	15	140	220	20	25	50	55
Kidney	560	10	–	20	25	160	170	30	30	40	65
Bladder	470	10	–	20	15	120	160	20	25	35	65
Cervix	410	10	–	20	10	85	160	15	10	45	50
Oral	340	–	–	15	5	80	140	20	10	30	40
Melanoma	330	5	–	10	10	55	150	15	10	30	45

– Fewer than 3 deaths

[1] Canada totals include provincial and territorial estimates. However, territories are not listed separately due to small numbers.

Note: Total of rounded numbers may not equal rounded total number. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2002 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 6

Estimated Age-Standardized Mortality Rates for Major Cancer Sites by Gender and Province, Canada, 2002

	Rate per 100,000										
	Canada*	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**224**	**263**	**251**	**264**	**259**	**258**	**212**	**221**	**215**	**202**	**195**
Lung	67	85	78	84	89	94	56	61	54	55	54
Prostate	29	31	32	35	35	26	29	29	39	33	24
Colorectal	22	25	22	19	17	31	21	23	22	19	16
Pancreas	9	8	12	11	12	10	9	8	9	9	9
Non-Hodgkin's Lymphoma	9	6	11	13	11	8	9	12	9	8	9
Leukemia	8	5	7	6	6	8	9	7	8	8	7
Stomach	7	17	8	7	6	9	6	8	5	7	6
Bladder	7	9	6	8	6	8	6	7	8	7	7
Kidney	6	8	5	7	9	6	5	7	4	5	5
Brain	5	5	4	6	6	7	5	6	6	5	5
Oral	4	5	5	5	4	5	4	5	3	3	4
Multiple Myeloma	4	4	8	7	5	4	4	5	4	3	4
Larynx	3	2	3	4	3	4	2	2	2	2	2
Melanoma	3	1	3	5	3	2	3	3	3	3	3
Females											
All Cancers	**151**	**157**	**156**	**176**	**158**	**160**	**145**	**160**	**143**	**144**	**140**
Lung	38	29	53	45	33	42	34	36	35	35	39
Breast	26	29	23	29	28	28	25	28	22	25	23
Colorectal	14	14	12	15	13	19	12	14	10	9	10
Pancreas	8	7	9	9	10	8	7	8	8	9	8
Ovary	8	8	4	7	7	7	8	9	8	8	8
Non-Hodgkin's Lymphoma	6	4	7	9	6	5	7	9	7	5	6
Brain	4	2	4	3	4	5	3	3	3	3	3
Leukemia	4	5	3	5	4	4	5	5	6	4	4
Stomach	3	9	–	3	2	4	3	2	3	4	2
Body of Uterus	3	2	2	5	3	3	3	4	2	3	3
Multiple Myeloma	3	3	–	3	2	3	3	2	3	3	2
Kidney	3	2	1	3	5	3	2	3	4	2	2
Oral	2	–	2	2	–	1	2	3	1	2	2
Melanoma	2	1	1	1	1	1	2	2	1	2	2
Cervix	2	3	2	3	1	2	2	1	1	3	2
Bladder	2	2	1	2	3	2	2	2	2	2	2

– Estimated age-standardized mortality rate is less than 0.5 per 100,000

* Canada totals include provincial and territorial estimates. However, territories are not listed separately due to small numbers.

Note: Rates adjusted to the age distribution of the 1991 Canadian population. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2002 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Trends in incidence and mortality for major types of cancer are assessed by comparing annual age-standardized rates. Figures 2.1 and 2.2 present the number of new cases and deaths for Canadian men and women, together with the corresponding age-standardized rates from 1973-1998 and with estimates to the year 2002. Figures 2.3 and 2.4 depict the relative contribution to the change in the total number of new cases and deaths that can be attributed to changes in cancer rates, population size and the aging of the population. Detailed depictions of the trends in annual rates for selected sites over the past 30 years are presented in Figures 3.1, 3.2 and 4.1, 4.2 with the data points provided in Tables 7.1, 7.2 and 8.1, 8.2. The average annual percent changes in site-specific incidence and mortality rates between 1991 and 1998 are listed in Table 9 and plotted in Figure 5.

The process of age standardization permits comparisons between calendar years, since it accounts for changes that have occurred over time in the age distribution of the population. Rates in this publication have been standardized to the 1991 Canadian population. Note also that the rapid increase in incidence rates throughout the 1970s displayed in Figures 2.1, 2.2 largely reflects improved registration of new cases in several provincial registries during this period. Registration levels, however, have generally stabilized since 1981 because of increasing consistency of cancer reporting procedures across Canada.[1]

All Sites

Among men, the cancer mortality rate, after reaching a peak in 1988 (Figure 2.2, Table 7.2) is declining slowly as a result of decreases in mortality rates for lung, colorectal and other cancers. In contrast, the cancer incidence rate rose slightly in the early 1990s because of the sharp increase in incidence of prostate cancer, and more recently has begun to level off or decline slightly. Among women, since 1989 cancer incidence has risen slightly whereas mortality rates have declined slightly (Figures 2.1 and 2.2, Tables 8.1, 8.2).

Figures 2.1 and 2.2 show that despite the relative stability in the age-standardized rates, the numbers of new cases and deaths continue to rise steadily as the Canadian population increases and ages. The numbers of new cases and deaths, as opposed to rates, are an important measure of cancer burden on the Canadian population and health care system. In 2002, the number of new cases is estimated to be 136,900 and the number of new deaths to be 66,200. These numbers can be used to plan patient services and health care facilities to meet the increasing demand.

Figures 2.3 and 2.4 show how changes since 1971 in the total population and in the age structure of the population have affected trends in the total number of cases and deaths. The lowest plot in these graphs represents the total number of cases (or deaths) that would have occurred each year if only the rates had changed but the population had remained the same as in 1971. The middle line represents the number of cases (or deaths) that would have occurred each year if the annual rates had acted upon a population that grew larger but maintained the same age distribution as in 1971. The top line represents the number of cases (or deaths) that actually occurred and thus reflects the combined impact of rate change, population growth and the aging of the population. These figures demonstrate that changes in population size and age structure have been the major determinants of the increasing burden of cancer among Canadians. An important implication is that as the Canadian population continues to age and grow in size, there will be a concordant increase in the number of new cases and deaths each year.

TRENDS IN INCIDENCE AND MORTALITY

Figure 6 plots an index (see definition in *Glossary*) of age-standardized mortality rates since 1971 for all sites combined and for all sites excluding lung cancer. Among men, lung cancer was responsible for the increase in cancer mortality rates until overall rates peaked in 1988. Since then, overall cancer mortality rates among men declined by similar percentages, whether or not lung cancer rates were included. Among women, the index shows that overall cancer mortality rates remained essentially stable until 1998; however, cancer mortality for all sites other than lung cancer has dropped by 17% during that period.

Trends by Selected Sites

Time trends of incidence and mortality rates over a 30-year period for selected cancer sites are shown for men in Figures 3.1 and 3.2 and for women in Figures 4.1 and 4.2, with the corresponding data points tabulated in Tables 7.1, 7.2, 8.1 and 8.2. Average annual percent changes for the set of cancer sites examined in this publication are summarized in Table 9 and Figure 5. In general, incidence and mortality rates for the majority of cancer sites have stabilized or declined during the past decade, with some notable exceptions.

Among women, lung cancer incidence and mortality rates continue their increase and are now almost four times as high as rates in 1973. However, estimated rates for lung cancer incidence and mortality among women in 2002 are still much lower than those among men. Among men, lung cancer rates leveled off in the mid-1980s and have since consistently declined, reflecting their drop in tobacco consumption beginning in the mid-1960s. Among women, smoking rates began to decline slightly only in the mid-1970s, thus benefits in terms of declining lung cancer rates have yet to become apparent (Figure 4.1 and Table 8.1).

After years of steady increases, incidence rates of prostate cancer rose particularly sharply from 1989 to 1993 (Tables 7.1). By contrast, mortality rates rose much more slowly from 1978, and appear to have declined in the mid 1990s. Increased incidence of prostate cancer before 1990 is at least partly due to increased detection of cancers following trans-urethral resection of the prostate (TURP) for suspected benign prostatic hypertrophy.[5] The sharp increase since 1990 is predominantly the result of increased early detection using PSA (determination of the Prostate Specific Antigen level).[6] This rate is now starting to show a decline (expected on theoretical grounds and illustrated by the experience to date in the United States[7]), probably because early detection has now exhausted the pool of prevalent cancer in the population that is screened.

Despite the sharp increase in incidence it is especially relevant to note that, during the period of sharp increases to 1993, there was no substantial associated change in mortality rates. Subsequently, mortality rates have fallen by more than 10% since their peak. Other methods of early detection that have been considered include digital rectal examination and transrectal ultrasonography.[8] Although much of the past increase in incidence has likely been due to early detection, changes in risk or protective factors might also account for some of the increases. However, no such risk or protective factors have yet been identified that could explain these changes.[6]

Breast cancer incidence among women also rose steadily but gradually between 1973 and 1992. This increase may be due, in part, to the rising number of mammographic examinations since the mid-1980s, but may also be affected by reproductive patterns.[9,10] However, since 1993 actual incidence rates have stabilized, and mortality rates for breast cancer have declined steadily since 1990. The most recent actual data for 1998

showed the breast cancer mortality rate to be at its lowest since 1950.[11] Similar declines are also occurring in the United States, the United Kingdom, and Australia.[11] Further research is needed to determine the respective impact on this decline of screening, improved treatment and changes in risk or protective factors.

Non-Hodgkin's lymphoma has shown a steady increase in incidence and mortality. This increased incidence is particularly marked in young adults aged 20-44 years (3.9% annual increase in males, and 5% annual increase in females) from 1987 to 1996 (see *Special Topic – Cancer Incidence in Young Adults*). The reason for the increase is not known, although there is speculation that eventually infectious agents will be shown to account for many lymphomas. Epidemiologists are studying various environmental and occupational exposures as well.

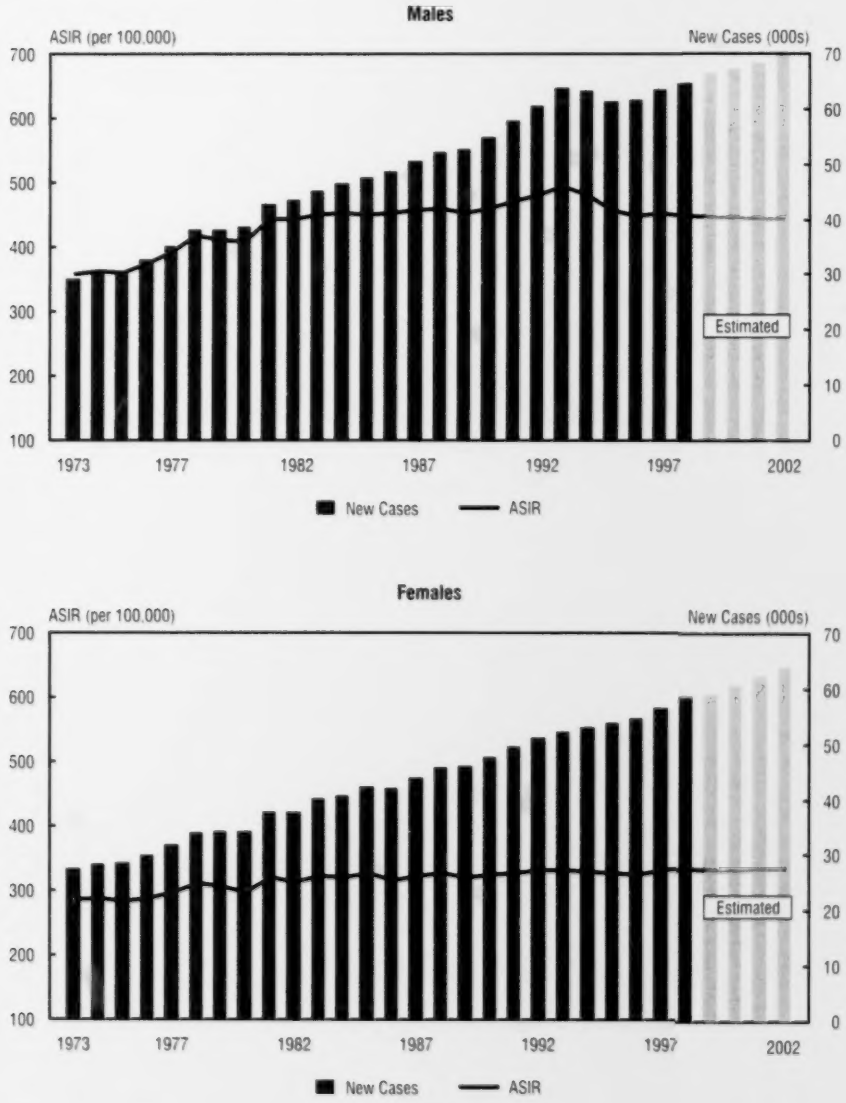
Of all the cancers analyzed in this report, the incidence of just two cancers among men and one among women has increased at an average rate greater than 2% annually between 1991 and 1998 (Table 9). These were cancers of the thyroid (+2.8%) and melanoma (+2.4%) in men, and thyroid cancer (+3.9%) in women The increasing rate of thyroid cancer has also been noted in Europe and parts of the United States. It is postulated that improved early detection practices and technologies (ultrasound and needle biopsy) are identifying early stage cancers more frequently than was possible in the past. As modern treatment achieves normal survival in the majority of patients it is unlikely that the mortality rate will increase. An increase in melanoma incidence may be related to intense sunlight exposure and to improvements in the detection of the disease. Other cancers showing a significant increase, but of less than 2%, were non-Hodgkin's lymphoma in both men and women, and lung cancer and melanoma in women.

Mortality rate increases have been greatest for lung cancer among women, with a significant increase of 2% per year. In both men and women, non-Hodgkin's lymphoma (+1.5% and +0.8% respectively) showed a statistically significant annual increase in mortality.

Rates for other cancer sites generally declined. Incidence and mortality rates for colorectal cancer continued to decrease, although the reasons are not completely understood. Some evidence suggests that lifestyle changes such as diet may have contributed to the declines. In addition, consensus is emerging internationally about the benefits of population-based screening for colorectal cancer. This is under consideration in Canada at both provincial and national levels. However, casual screening is already prevalent in Canada and may have contributed to the reduction in mortality rates. This effect can best be evaluated by the establishment and evaluation of organized screening programs.

Mortality rates have dropped dramatically for Hodgkin's disease (–6% among men and –7.4% among women), whereas incidence was quite stable, which suggests that treatment and survival may have improved. Continuing large declines in incidence for stomach cancer (–2.6% for men and –2.3% for women) and mortality (–2.7% among men and –3.5% among women) may reflect improved diets and the role of infectious agents (e.g. *Helicobacter pylori*). Lower rates of invasive cervical cancer (–2.0% incidence and –1.9% mortality) likely reflect the impact of early detection and treatment of pre-malignant lesions through Pap smear screening and treatment of non-invasive lesions. Statistically significant declines in incidence also occurred for oral, pancreas, larynx, lung and bladder cancers, and leukemia among men, and bladder cancer and leukemia among women. Likewise, small but statistically significant declines in mortality rates have occurred in oral, pancreas, larynx and lung cancer in men.

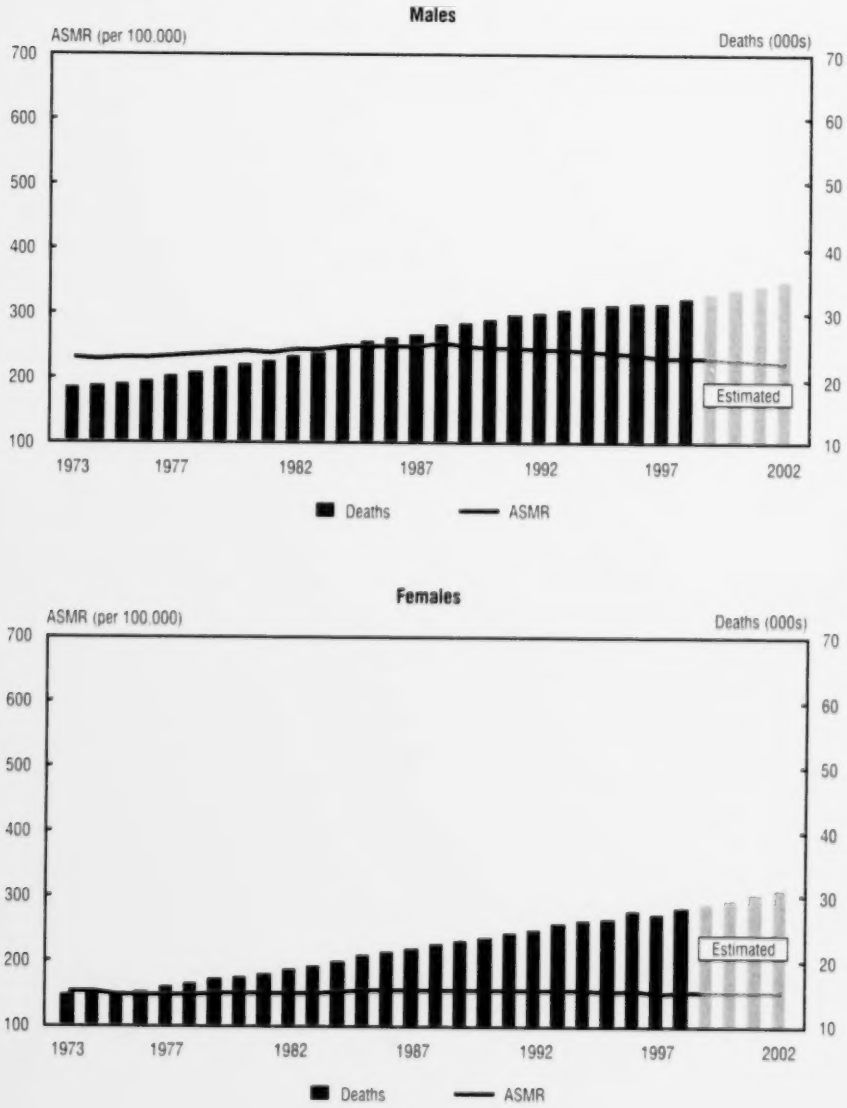
Figure 2.1
New Cases and Age-Standardized Incidence Rates (ASIR) for All Cancers, Canada, 1973-2002



Note: All cancers exclude non-melanoma skin cancer (ICD-9 173). Rates are standardized to the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 2.2
Deaths and Age-Standardized Mortality Rates (ASMR) for All Cancers, Canada, 1973-2002

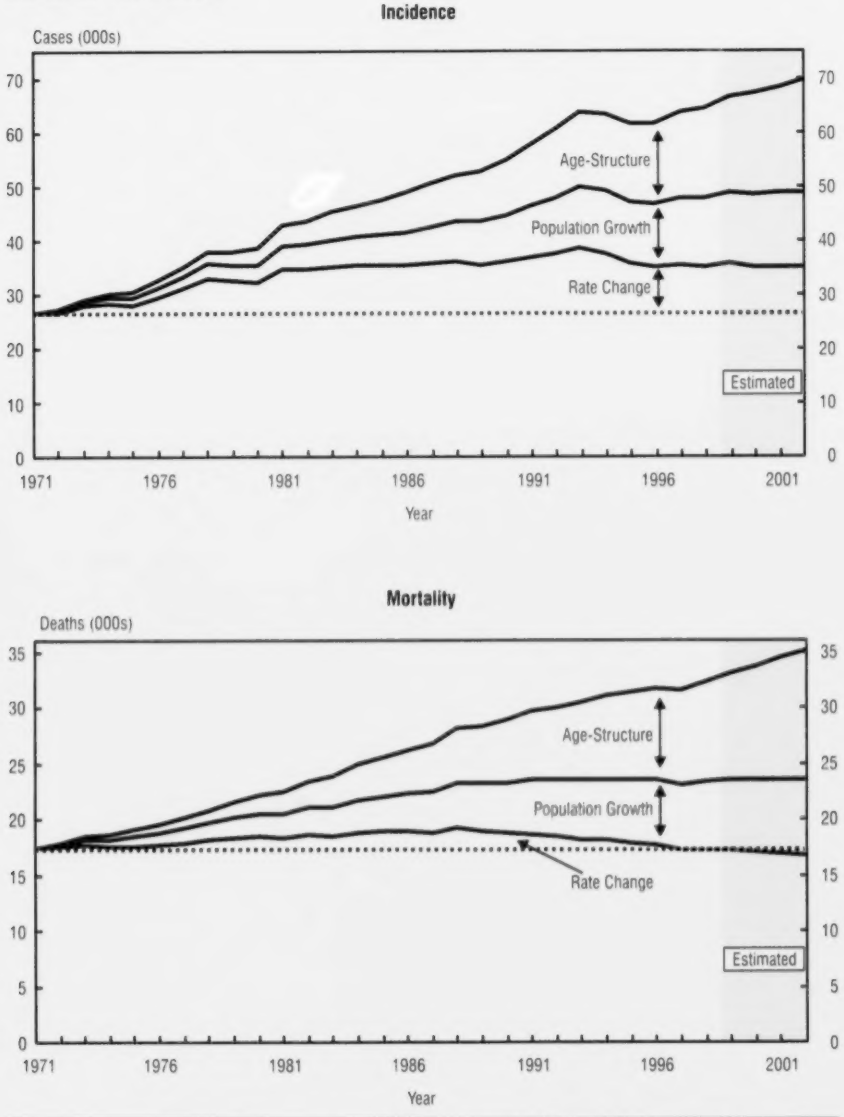


Note: All cancers exclude non-melanoma skin cancer (ICD-9 173). Rates are standardized to the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 2.3

Trends in New Cases and Deaths Attributed to Cancer Rate, Population Growth, and Population Age-Structure, All Cancers, All Ages, Males, Canada, 1971-2002

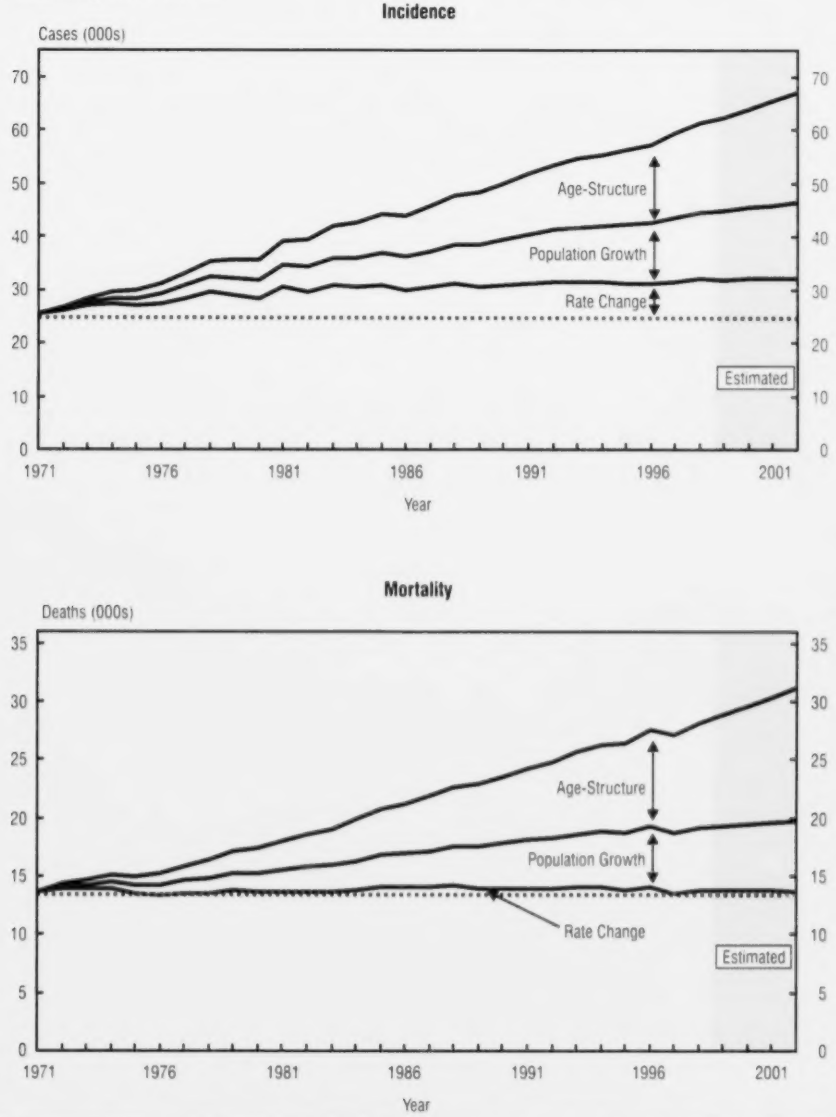


Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Magnitude of area represents the number of cases/deaths due to each change. Please refer to *Appendix II: Methods* for futher details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 2.4

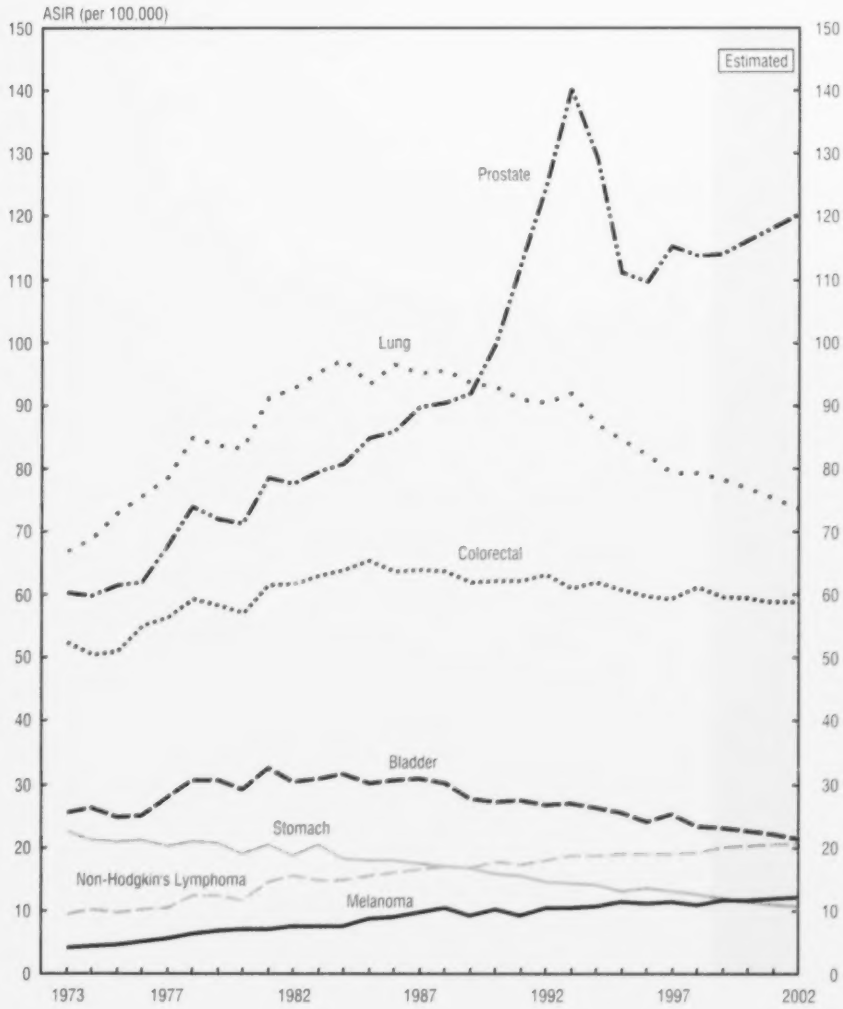
Trends in New Cases and Deaths Attributed to Cancer Rate, Population Growth, and Population Age-Structure, All Cancers, All Ages, Females, Canada, 1971-2002



Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Magnitude of area represents the number of cases/deaths due to each change. Please refer to *Appendix II: Methods* for futher details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 3.1
Age-Standardized Incidence Rates (ASIR) for Selected Cancer Sites, Males, Canada, 1973-2002

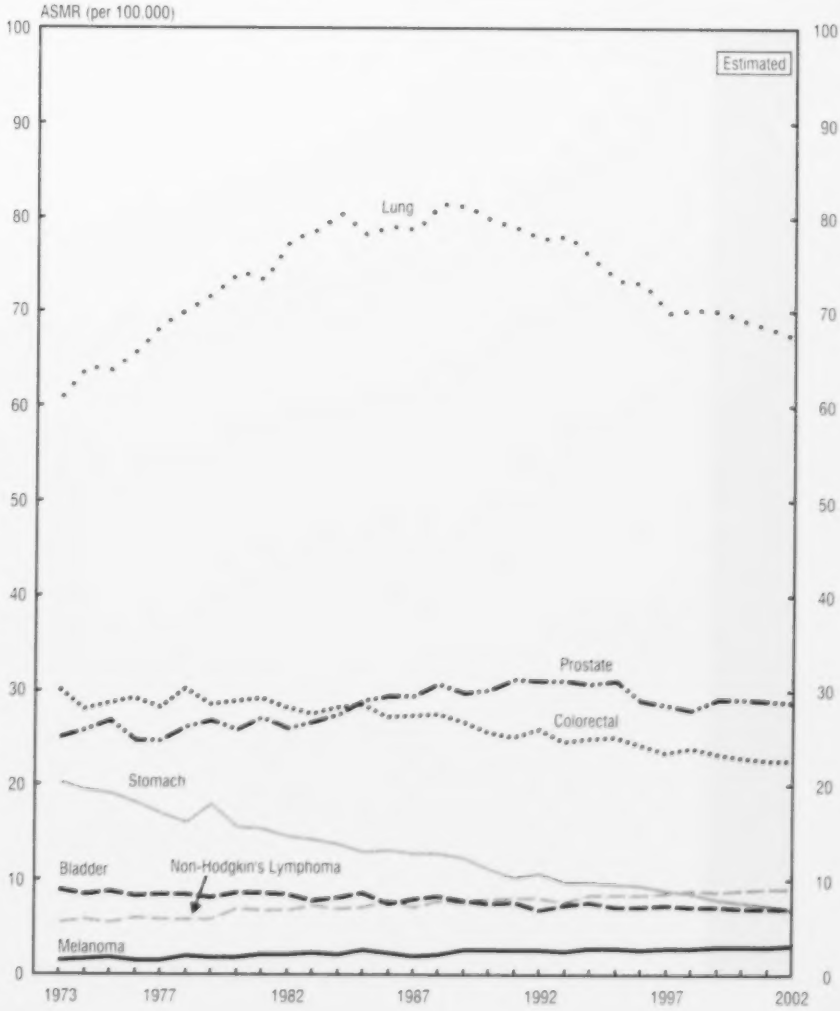


Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.1 for data points.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 3.2

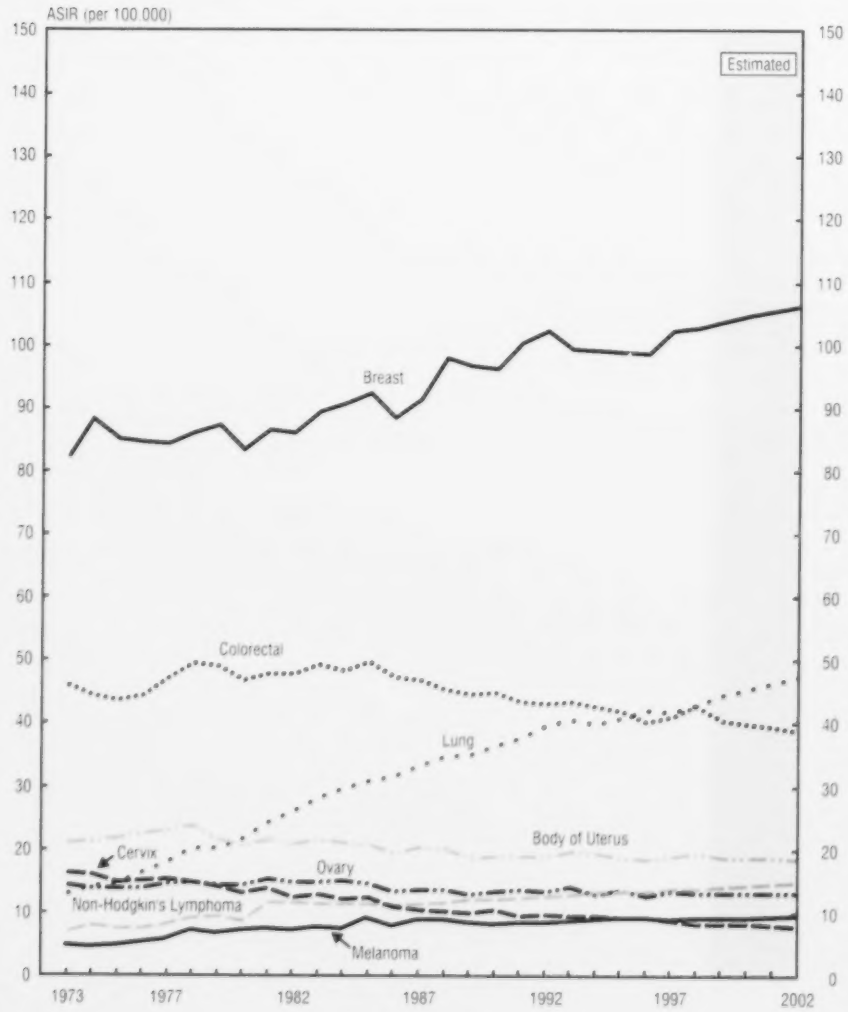
Age-Standardized Mortality Rates (ASMR) for Selected Cancer Sites, Males, Canada, 1973-2002



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.2 for data points.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

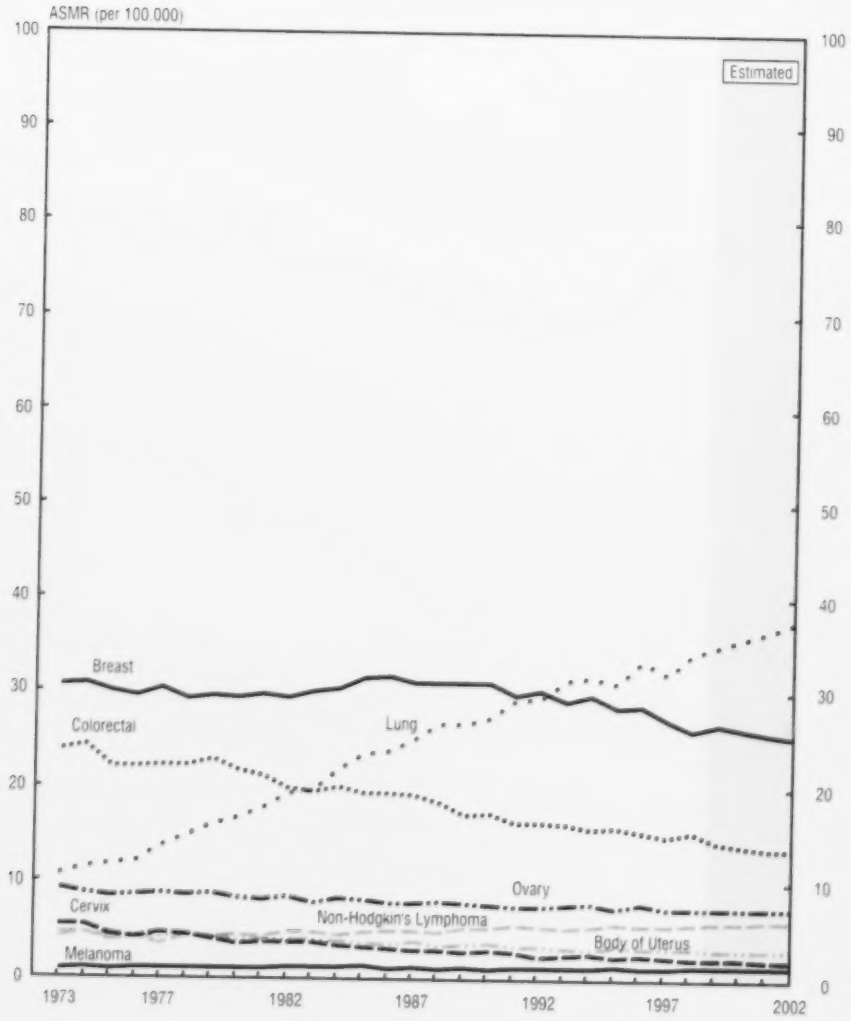
Figure 4.1
Age-Standardized Incidence Rates (ASIR) for Selected Cancer Sites, Females, Canada, 1973-2002



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.1 for data points.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 4.2
Age-Standardized Mortality Rates (ASMR) for Selected Cancer Sites, Females, Canada, 1973-2002



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.2 for data points.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 7.1

Age-Standardized Incidence Rates for Selected Cancer Sites, Males, Canada, 1973-2002

Year	Rate per 100,000							
	All Cancers	Prostate	Lung	Colorectal	Bladder	Non-Hodgkin's Lymphoma	Melanoma	Stomach
1973	355.8	60.4	66.9	52.6	25.6	9.5	4.1	22.5
1974	359.8	60.0	69.0	50.8	26.4	10.1	4.5	21.1
1975	357.7	61.7	73.1	51.2	24.8	9.7	4.7	21.0
1976	371.9	62.1	75.7	55.3	25.1	10.1	5.1	21.2
1977	391.4	67.9	78.6	56.4	28.0	10.5	5.5	20.1
1978	417.2	74.0	85.1	59.4	30.6	12.5	6.4	20.9
1979	409.8	72.0	83.9	58.5	30.6	12.4	6.8	20.8
1980	406.1	71.4	83.2	57.3	29.2	11.6	7.0	19.0
1981	442.1	78.5	91.2	61.6	32.5	14.7	7.0	20.5
1982	440.7	77.8	92.6	61.9	30.3	15.6	7.5	18.7
1983	448.4	79.6	95.2	63.0	30.8	14.9	7.6	20.4
1984	450.0	80.9	97.1	64.0	31.7	14.9	7.5	18.4
1985	449.8	85.0	93.2	65.4	30.2	15.7	8.7	18.0
1986	451.9	86.1	96.4	63.8	30.6	16.0	9.0	18.0
1987	456.3	89.5	95.0	64.0	30.8	16.6	9.6	17.4
1988	458.4	90.4	95.5	63.7	30.3	17.0	10.4	17.0
1989	451.5	91.8	93.6	62.1	27.9	16.7	9.3	16.8
1990	457.6	99.8	92.7	62.2	27.2	17.7	10.1	15.8
1991	469.0	112.3	90.7	62.3	27.5	17.4	9.1	15.6
1992	480.1	125.3	90.3	63.4	26.8	17.9	10.5	14.6
1993	494.0	140.4	91.9	61.3	27.0	18.8	10.4	14.3
1994	479.3	129.3	87.2	62.4	26.3	18.8	10.8	14.1
1995	455.3	111.1	84.7	60.8	25.7	19.0	11.3	13.3
1996	446.3	109.5	82.2	60.1	24.1	19.1	11.1	13.6
1997	450.7	115.1	79.5	59.6	25.4	19.1	11.4	13.1
1998	445.8	113.7	79.3	61.3	23.5	19.3	11.1	12.6
1999*	444.9	113.9	78.5	59.9	23.2	19.9	11.6	11.9
2000*	443.9	116.0	76.9	59.6	22.7	20.2	11.8	11.5
2001*	443.0	118.2	75.4	59.3	22.1	20.5	11.9	11.0
2002*	442.0	120.3	73.9	59.0	21.5	20.7	12.1	10.6

* Estimated rates

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 7.2
Age-Standardized Mortality Rates for Selected Cancer Sites, Males, Canada, 1973-2002

Year	Rate per 100,000							
	All Cancers	Lung	Prostate	Colorectal	Non-Hodgkin's Lymphoma	Bladder	Stomach	Melanoma
1973	230.6	60.7	25.0	30.2	5.6	9.0	20.2	1.5
1974	229.2	63.9	25.9	28.0	5.9	8.5	19.4	1.6
1975	230.4	63.7	26.8	28.7	5.6	8.8	19.1	1.7
1976	230.2	65.8	24.7	29.3	6.0	8.3	18.2	1.5
1977	233.5	68.5	24.6	28.2	5.9	8.4	17.0	1.5
1978	236.3	70.1	26.1	30.2	5.9	8.4	16.1	1.9
1979	239.3	71.7	26.7	28.6	5.9	8.1	18.0	1.7
1980	240.7	74.0	25.7	28.9	7.0	8.6	15.5	1.7
1981	239.2	73.2	27.1	29.2	6.9	8.6	15.3	2.1
1982	243.5	77.4	26.0	28.2	6.8	8.4	14.6	2.1
1983	242.9	78.4	26.7	27.7	7.2	7.8	14.3	2.3
1984	247.8	80.2	27.4	28.3	7.0	8.1	13.9	2.1
1985	249.0	78.0	28.9	28.6	7.1	8.6	13.0	2.6
1986	249.0	79.0	29.4	27.2	7.7	7.4	13.1	2.3
1987	248.2	78.6	29.4	27.5	7.1	7.9	12.9	2.0
1988	254.7	81.3	30.7	27.6	7.8	8.3	12.8	2.2
1989	249.5	81.1	29.7	26.8	7.7	7.8	12.3	2.6
1990	246.4	79.5	30.1	25.7	7.9	7.5	11.3	2.6
1991	247.2	78.8	31.2	25.1	8.1	7.7	10.3	2.6
1992	244.6	77.5	31.0	25.9	8.1	6.9	10.7	2.6
1993	242.6	77.9	31.0	24.7	7.7	7.4	9.7	2.4
1994	241.6	75.5	30.7	25.0	8.4	7.6	9.7	2.7
1995	238.7	73.2	31.0	25.1	8.4	7.2	9.6	2.8
1996	236.2	72.9	29.0	24.3	8.4	7.2	9.4	2.6
1997	229.5	69.9	28.4	23.5	8.6	7.4	8.9	2.8
1998	229.8	70.1	27.9	24.0	8.9	7.2	8.6	2.8
1999*	229.8	70.0	29.1	23.3	8.8	7.1	8.0	2.9
2000*	228.0	69.1	29.0	23.0	8.9	7.0	7.6	2.9
2001*	226.1	68.1	28.9	22.7	9.0	7.0	7.3	3.0
2002*	224.2	67.2	28.8	22.4	9.1	6.9	6.9	3.0

* Estimated rates

Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 8.1
Age-Standardized Incidence Rates for Selected Cancer Sites, Females, Canada, 1973-2002

Year	Rate per 100,000									
	All Cancers	Breast	Lung	Colorectal	Body of Uterus	Non-Hodgkin's Lymphoma	Ovary	Melanoma	Cervix	Stomach
1973	291.6	82.2	12.9	46.2	21.2	7.2	14.4	5.2	16.3	10.6
1974	294.9	88.2	14.0	44.4	21.5	8.1	13.8	5.0	16.1	9.9
1975	290.2	85.1	14.7	43.7	21.8	7.5	13.7	5.1	14.9	10.4
1976	294.9	84.6	16.3	44.6	22.7	7.5	13.9	5.6	15.2	9.3
1977	306.0	84.4	17.9	47.2	23.0	8.3	14.5	6.1	15.4	9.3
1978	319.3	86.1	20.1	49.5	23.9	9.2	14.9	7.6	14.7	9.5
1979	313.8	87.3	20.3	49.1	21.7	9.6	14.5	7.1	14.2	9.2
1980	305.5	83.3	21.7	46.8	20.8	8.8	14.4	7.5	13.0	8.6
1981	328.1	86.5	24.3	47.8	21.6	11.6	15.4	7.8	13.9	9.8
1982	321.0	86.0	25.9	48.0	21.0	11.7	14.7	7.5	12.3	8.7
1983	332.8	89.3	28.3	49.4	21.6	11.5	14.9	8.0	12.9	8.7
1984	329.5	90.3	29.6	48.3	21.2	11.3	15.0	7.7	12.2	8.1
1985	335.5	92.2	30.9	49.8	20.8	11.4	14.6	9.5	12.3	8.0
1986	324.9	88.6	31.6	47.4	19.5	11.3	13.3	8.3	10.9	8.3
1987	330.7	91.1	33.2	46.9	20.5	11.5	13.7	9.3	10.4	8.0
1988	336.0	97.8	34.8	45.4	20.1	11.7	13.6	9.2	10.2	7.2
1989	330.0	96.4	35.0	44.7	18.7	12.2	13.0	8.6	10.0	7.2
1990	333.2	96.0	36.5	45.0	19.0	12.1	13.4	8.5	10.4	6.9
1991	337.1	100.1	37.7	43.5	18.9	12.4	13.6	8.8	9.6	6.4
1992	340.9	102.0	39.6	43.4	18.9	12.7	13.5	8.7	9.6	6.5
1993	340.9	99.1	40.6	43.6	19.7	12.9	14.1	9.0	9.5	6.3
1994	339.0	98.9	39.8	43.1	19.4	13.5	12.9	9.2	9.4	6.3
1995	337.2	98.7	40.8	41.9	18.6	13.3	13.6	9.4	9.3	6.0
1996	335.2	98.5	41.9	40.4	18.5	13.3	12.5	9.5	9.2	5.9
1997	340.4	102.0	41.9	41.1	18.9	13.8	13.3	9.5	8.7	5.6
1998	345.3	102.6	42.9	43.1	19.5	13.9	13.2	9.5	8.2	5.6
1999*	344.0	103.6	44.6	40.5	18.8	14.2	13.2	9.6	8.4	5.2
2000*	345.1	104.4	45.5	40.1	18.7	14.4	13.1	9.6	8.2	5.0
2001*	346.2	105.3	46.4	39.6	18.6	14.6	13.1	9.7	8.0	4.8
2002*	347.3	106.1	47.3	39.2	18.6	14.9	13.1	9.8	7.8	4.6

* Estimated rates

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 8.2
Age-Standardized Mortality Rates for Selected Cancer Sites, Females, Canada, 1973-2002

Year	Rate per 100,000									
	All Cancers	Lung	Breast	Colorectal	Ovary	Non-Hodgkin's Lymphoma	Stomach	Body of Uterus	Cervix	Melanoma
1973	152.1	10.9	31.0	24.3	9.7	4.3	9.6	4.8	5.6	1.1
1974	152.5	11.7	31.1	24.7	9.1	4.8	9.0	4.7	5.6	1.3
1975	147.3	12.1	30.3	22.4	8.9	4.0	8.8	4.3	4.7	1.2
1976	146.0	12.4	29.9	22.5	9.1	4.4	8.5	4.4	4.4	1.3
1977	147.1	13.9	30.6	22.7	9.1	3.8	7.4	4.4	4.8	1.3
1978	147.6	15.0	29.5	22.7	9.0	4.5	7.4	4.6	4.7	1.3
1979	150.2	16.3	29.8	23.3	9.1	4.4	7.2	4.3	4.2	1.2
1980	148.4	17.1	29.7	22.2	8.6	4.6	6.8	4.2	3.7	1.2
1981	149.0	17.9	30.1	21.6	8.5	4.5	7.5	4.1	3.9	1.3
1982	149.3	19.5	29.7	20.3	8.8	4.9	6.7	4.1	3.9	1.5
1983	149.4	19.9	30.4	19.9	8.2	4.9	6.5	4.2	3.9	1.5
1984	151.8	22.2	30.7	20.4	8.7	4.7	5.7	4.0	3.5	1.5
1985	154.8	23.8	31.8	19.8	8.5	5.0	6.0	3.8	3.3	1.6
1986	154.3	24.0	32.0	19.7	8.2	5.1	6.1	3.6	3.2	1.3
1987	154.0	25.3	31.3	19.6	8.2	5.2	5.7	4.1	3.0	1.5
1988	155.3	26.9	31.4	18.8	8.4	5.0	5.1	3.6	3.0	1.3
1989	153.0	27.0	31.2	17.6	8.1	5.5	5.5	3.7	2.9	1.4
1990	153.0	27.6	31.3	17.7	8.1	5.5	5.0	3.9	3.0	1.2
1991	153.5	29.5	30.1	16.8	7.8	5.7	4.9	3.5	2.8	1.4
1992	153.1	29.6	30.4	16.6	7.8	5.5	4.9	3.5	2.4	1.5
1993	154.8	31.7	29.4	16.6	8.0	5.5	4.5	3.4	2.6	1.5
1994	155.0	31.9	30.0	16.1	8.1	5.7	4.5	3.2	2.7	1.5
1995	151.8	31.3	28.7	16.2	7.7	5.9	4.6	3.6	2.4	1.6
1996	155.1	33.6	28.9	15.7	8.2	5.8	4.4	3.4	2.6	1.5
1997	148.7	32.3	27.4	15.2	7.6	5.7	3.9	3.4	2.4	1.5
1998	150.9	34.5	26.4	15.7	7.7	6.0	3.8	3.4	2.3	1.5
1999*	151.4	35.4	26.9	14.6	7.7	6.0	3.7	3.3	2.2	1.5
2000*	151.1	36.2	26.5	14.3	7.7	6.1	3.5	3.2	2.2	1.6
2001*	150.8	37.0	26.1	13.9	7.6	6.2	3.4	3.2	2.1	1.6
2002*	150.6	37.8	25.6	13.6	7.6	6.3	3.2	3.1	2.0	1.6

* Estimated rates

Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 9

Average Annual Percent Change (AAPC) in Age-Standardized Incidence (1991-1998) and Mortality (1991-1998) Rates for Selected Cancer Sites, Canada

	AAPC in Incidence 1991-1998		AAPC in Mortality 1991-1998	
	Males	Females	Males	Females
All Cancers	**-1.2***	**0.1**	**-1.1****	**-0.3**
Oral	-3.6**	-1.2	-3.0**	-0.1
Stomach	-2.6**	-2.3**	-2.7**	-3.5**
Colorectal	-0.6*	-0.7	-1.0*	-1.3**
Pancreas	-1.6**	-0.1	-1.3*	-0.1
Larynx	-3.5**	-2.3	-3.4**	-4.4
Lung	-2.3**	1.6**	-1.8**	2.0**
Melanoma	2.4*	1.4**	1.3	0.5
Female Breast	–	0.2	–	-1.8**
Body of Uterus	–	0.0	–	-0.4
Cervix	–	-2.0**	–	-1.9
Ovary	–	-0.6	–	-0.2
Prostate	-1.5	–	-1.7**	–
Testis	1.2	–	-0.3	–
Bladder	-2.1**	-1.5*	-0.3	-0.4
Kidney	-0.3	-0.5	0.1	0.0
Brain	-0.4	0.2	0.6	-0.5
Thyroid	2.8*	3.9**	0.6	2.2
Non-Hodgkin's Lymphoma	1.3**	1.5**	1.5*	0.8*
Hodgkin's Disease	-1.4*	-0.2	-6.0**	-7.4*
Multiple Myeloma	1.4	0.4	0.7	-1.0
Leukemia	-0.9**	-0.8*	-0.9	-1.4

– Not applicable

* Significant at p = 0.05

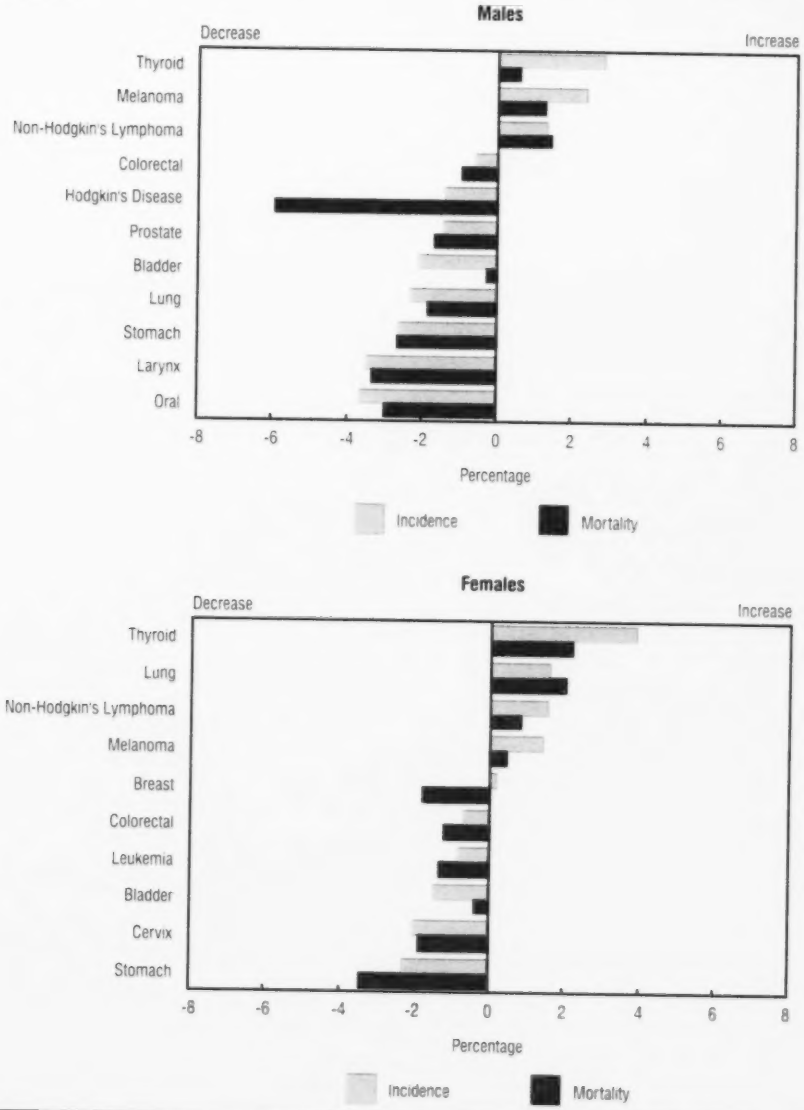
** Significant at p = 0.01

Note: Average Annual Percent Change is calculated assuming a log linear model; incidence rates exclude non-melanoma skin cancer (ICD-9 173).

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

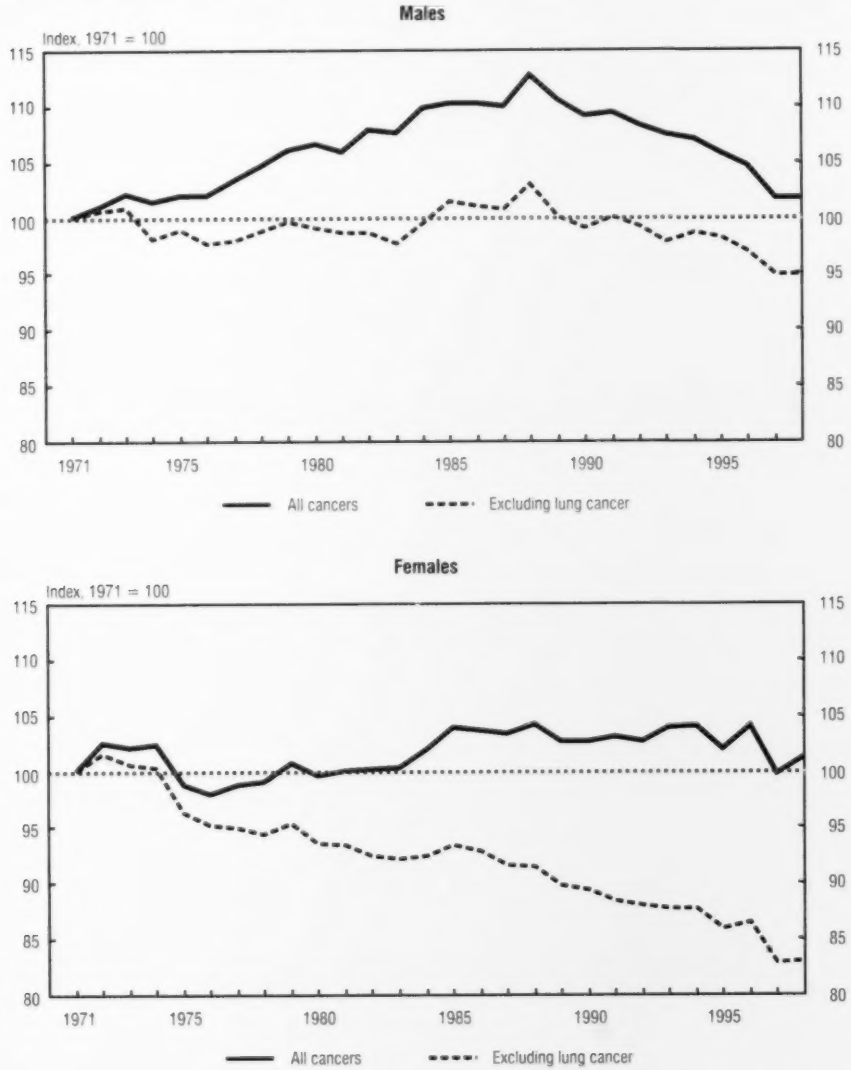
Figure 5

Average Annual Percent Change (AAPC) in Age-Standardized Incidence (1991-1998) and Mortality (1991-1998) Rates for Selected Cancer Sites, Canada



Note: See Table 9 for percent change for all sites. Sites are ranked in decreasing order of incidence.
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 6
Index of Age-Standardized Mortality Rates Including and Excluding Lung Cancer, Canada, 1971-1998



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See also the *Glossary* and *Appendix II: Methods*.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

AGE AND GENDER DISTRIBUTION OF CANCER

This section shows estimates for 2002 by 10-year age groups for all sites combined (Table 10) and for the four leading types of cancer (Table 11). Cancer is primarily a disease of the elderly. The estimates for 2002 shown in Table 10 indicate that 59,600 new cases (44%) and 39,300 cancer deaths (59%) occur in Canadians aged 70 years or more, while an additional 34,100 new cases (25%) and 14,300 deaths (22%) occur in those aged 60-69. By contrast, just 1% of new cases and only 0.3% of deaths occur prior to age 20. Estimates for leading sites for people aged 20 or more presented in Table 11 show that close to 50% of all newly diagnosed cancers of the lung, prostate, colon and rectum occur among Canadians aged 70 or more. This is especially true for prostate cancer, with 45% of cases and 84% of deaths occurring in men over 70. In the case of breast cancer, 22% of cases occur in women under age 50, 47% occur in women aged 50 to 69 and 31% in women aged 70 and over.

Trends in age-standardized rates of incidence and mortality since 1971 for all cancers are plotted by four age groups with actual and estimated rates (Figure 7). Since 1981, absolute increases in cancer incidence rates have occurred primarily in Canadians aged 50 or over, and this trend has been stronger among men than among women. The gender difference is almost certainly due to the rapid increases observed in prostate cancer in the early 1990s.

Most encouraging is the fairly steady decline in mortality that has occurred since 1988 among both men and women in all age groups under 70 years. Mortality rates have generally declined substantially since 1970 among Canadians aged 0-19 with more moderate declines in the 20-49 age group. Among 50-69 year-old men and women, decreases in mortality rates have occurred primarily since the late 1980s.

Age-specific rates of cancer incidence and mortality by five-year age groups are plotted using actual data for cancer incidence and mortality in 1998, the most recent year for which complete data are available (Figure 8). Cancer incidence and mortality increase substantially with age in both sexes with 17 times as many new cases occurring in those over 80 years old as in those under 20, despite having only 13% of the population size. Although incidence rates were somewhat higher among women than men between 20 and 54 years of age, for all other age groups incidence was higher among men. This is because of the higher incidence of cancers of the breast and genital organs in women of reproductive age, and the higher incidence of most types of cancer in older men. Mortality rates were higher among men than women for all age groups with the exception of those aged 35-54.

Table 10
Distribution by Age Group and Gender, Canada, 2002

Age Group	Population (000s) 2002 Estimates			New Cases 2002 Estimates			Deaths 2002 Estimates		
	Total	M	F	Total	M	F	Total	M	F
0-19	7,865	4,036	3,829	1,300	680	600	200	110	90
20-29	4,232	2,153	2,079	1,650	760	900	240	140	110
30-39	4,819	2,434	2,385	4,500	1,650	2,800	820	350	470
40-49	5,143	2,572	2,571	11,900	4,100	7,800	3,400	1,400	1,950
50-59	3,876	1,925	1,952	23,900	11,100	12,800	8,000	4,100	3,900
60-69	2,469	1,197	1,272	34,100	19,900	14,200	14,300	8,300	6,100
70-79	1,842	816	1,026	37,200	21,100	16,100	20,800	11,700	9,000
80+	1,013	344	669	22,400	10,500	11,900	18,500	9,000	9,500
All Ages	**31,260**	**15,478**	**15,782**	**136,900**	**69,800**	**67,200**	**66,200**	**35,100**	**31,100**

Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details. 2002 population projections were provided by the Census and Demographics Branch, Statistics Canada.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 11
Distribution by Selected Cancer Site, Age Group and Gender, Canada, 2002

Age Group	Lung			Colorectal			Prostate	Breast
	Total	M	F	Total	M	F	M	F
New Cases								
20-29	20	15	10	35	15	20	–	70
30-39	180	80	100	230	120	110	–	890
40-49	1,000	450	560	970	500	470	320	3,500
50-59	3,200	1,650	1,550	2,600	1,500	1,100	3,000	5,300
60-69	6,000	3,600	2,400	4,300	2,600	1,650	6,700	4,400
70-79	7,000	4,300	2,700	5,500	3,100	2,500	5,800	3,900
80+	3,400	1,900	1,450	3,900	1,650	2,300	2,400	2,400
Ages 20+	**20,800**	**12,000**	**8,800**	**17,600**	**9,500**	**8,100**	**18,200**	**20,500**
Deaths								
20-29	5	–	–	10	5	5	–	5
30-39	110	40	65	60	30	35	–	140
40-49	740	310	430	250	120	120	20	580
50-59	2,400	1,250	1,100	730	420	310	120	950
60-69	4,900	3,000	1,950	1,350	860	480	550	930
70-79	6,500	4,000	2,600	2,000	1,150	840	1,500	1,300
80+	3,700	2,200	1,600	2,200	930	1,250	2,100	1,500
Ages 20+	**18,400**	**10,700**	**7,700**	**6,600**	**3,500**	**3,000**	**4,300**	**5,400**

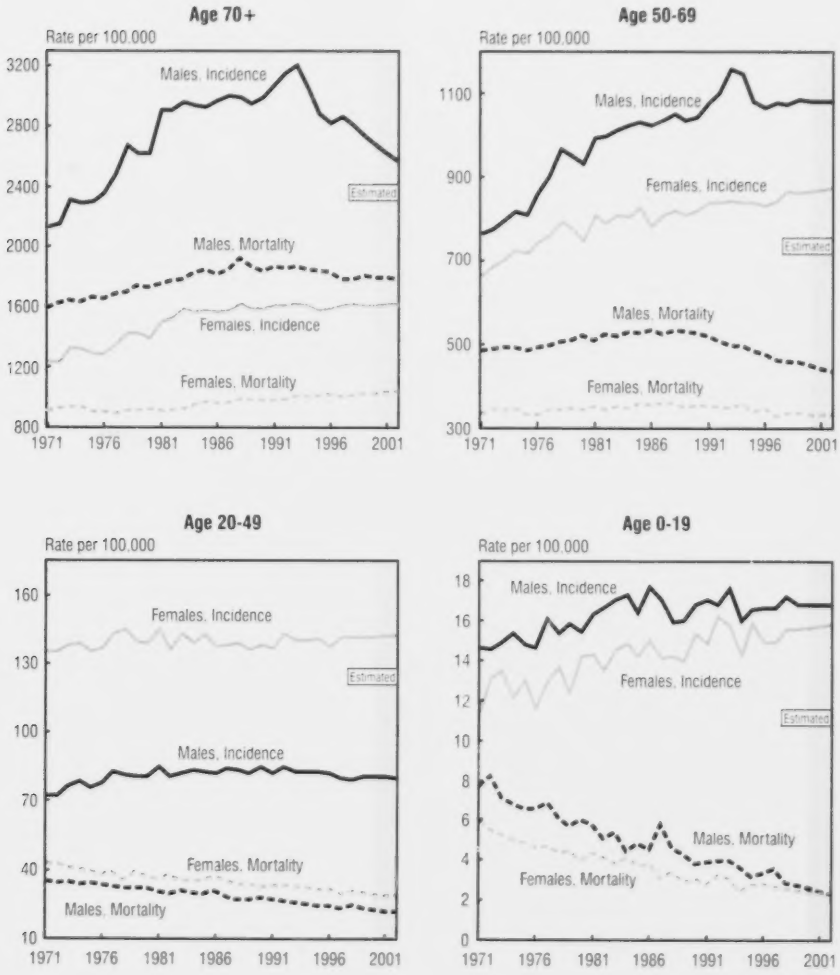
– Fewer than 3 cases or deaths.

Note: Figures exclude non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 7

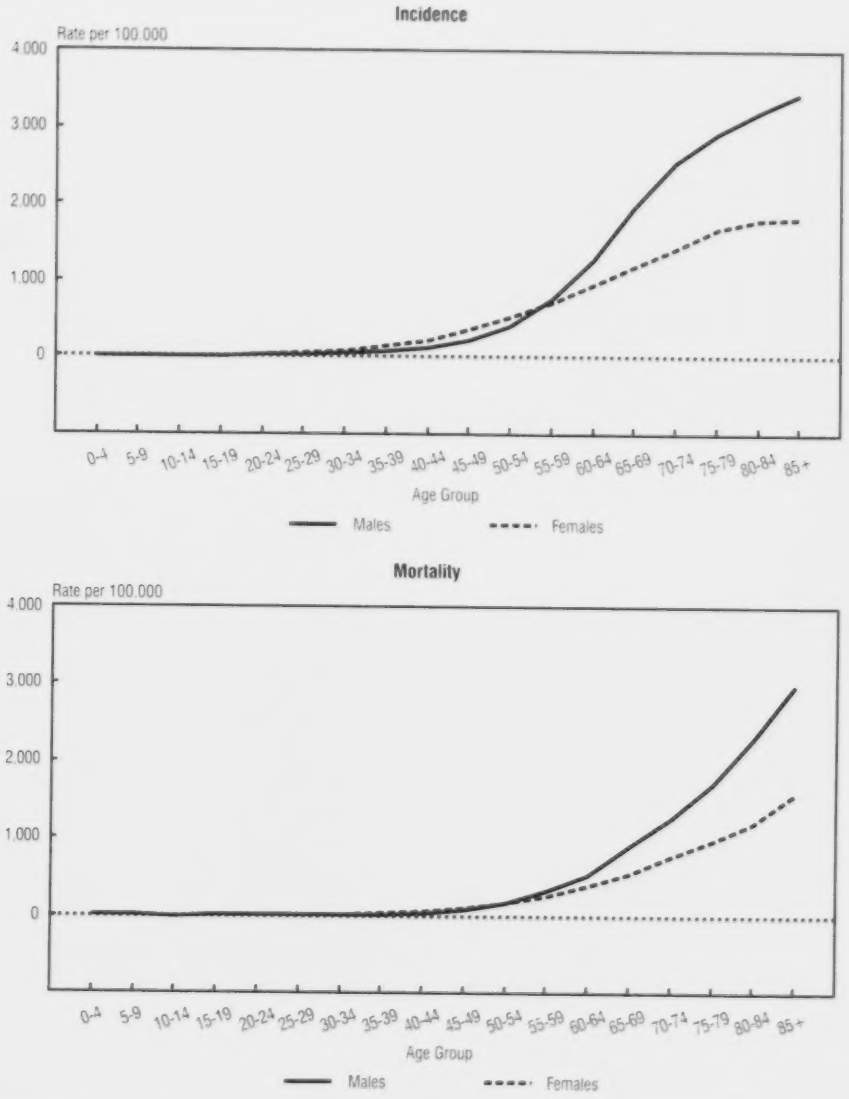
Age-Standardized Incidence and Mortality Rates by Broad Age Group, All Cancers, Canada, 1971-2002



Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173).
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Figure 8

Age-Specific Incidence (1998) and Mortality (1998) Rates for All Cancers by Gender, Canada



Note: Incidence rates exclude non-melanoma skin cancer (ICD-9 173).
Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

PROBABILITY OF DEVELOPING/DYING FROM CANCER

Table 12 presents the probability (expressed as a percentage) of Canadians developing the more common cancers within specific decades of age, as well as the lifetime probability of developing, or dying from, one of these cancers. The calculation of these probabilities models the occurrence of cancer in a hypothetical cohort. For example, if a cohort of 1,000 men of age 50 is followed until the end of age 59, 57 of them, or 5.7% (1 in 17.5), will develop some type of cancer within this 10-year period; this percentage therefore describes the risk of a 50-year-old man developing some type of cancer before age 60. Similarly, a 60-year-old woman has a 10.2% (1 in 9.8) chance of developing some type of cancer before age 70. For the lifetime probability of developing cancer, the data are presented both as the probability (expressed as a percentage) of developing cancer and as the inverse of that probability. For example, men have a lifetime probability of 0.41 (41%) of developing cancer, while the inverse of that probability is 2.4. Thus, approximately 2 of every 5 men are expected to develop cancer of some site during life. Similarly, 1 in 2.7 women (slightly more than 1 of every 3 women) will develop cancer during life. One in 3.7 men and 1 in 4.4 women (i.e. more than 1 in 4 and 1 in 5 respectively) will die of cancer.

During their lifetimes, 1 in 8.8 women are expected to develop breast cancer, the most common cancer (excluding non-melanoma skin cancer) to afflict women, and 1 in 26.6 women are expected to die from it. One in 16.3 women will develop colorectal cancer, but only 1 in 37.7 will die from it. One in 18.1 will develop lung cancer, and 1 in 20.8 will die from this disease, making it the most likely cause of cancer death in Canadian women. Over their lifetimes, 1 in 8.3 men will develop prostate cancer, but only 1 in 27.7 will die from it. One in 11.4 men will develop lung cancer, and 1 in 12.2 will die from this condition. Lung cancer is thus by far the leading cause of cancer deaths in Canadian men.

The probability of developing cancer within the next 10 years gives a useful indication of the short-term risk of cancer. Although the lifetime risk of developing breast cancer is 11.4% (1 in 8.8), and although the risk increases with age, the chance of a 60-year-old woman developing breast cancer before age 70 is only 3% (1 in 33.3); this figure may be more meaningful than the lifetime probability statistic for a 60-year-old woman contemplating her risk of breast cancer. Table 12 shows how steeply the risk of developing prostate cancer rises with age. A man has very little probability of developing prostate cancer by age 50. However, a 70-year-old man has a 6.1% (1 in 16.4) chance of developing prostate cancer by age 80; this percentage represents the highest risk for either men or women of developing a specific cancer in any decade of life.

The decrease in the probability of very old persons (80-89) developing, or dying from, many cancers, in contrast to the general increasing risk with increasing age, is due to the increase in the probability of death from other causes at a very advanced age.

Table 12

Probability of Developing Cancer by Age, and Lifetime Probability of Developing and Dying from Cancer, Canada

	Probability (%) of Developing Cancer in next 10 years by age group						Lifetime Probability (%) of: Developing		Dying	
	30-39	40-49	50-59	60-69	70-79	80-89	%	One in:	%	One in:
Male										
All Cancers	**0.6**	**1.6**	**5.7**	**14.4**	**20.9**	**19.6**	**41.2**	**2.4**	**27.1**	**3.7**
Prostate	–	0.1	1.2	4.6	6.1	5.5	12.0	8.3	3.6	27.7
Lung	–	0.2	1.0	2.9	4.5	3.5	8.8	11.4	8.2	12.2
Colorectal	0.1	0.2	0.8	2.0	3.2	3.1	6.7	15.0	2.9	34.6
Lymphoma	0.1	0.2	0.4	0.7	1.1	1.1	2.9	34.8	1.6	63.7
Bladder	–	0.1	0.2	0.7	1.3	1.5	2.7	37.7	0.9	108.7
Kidney	–	0.1	0.3	0.5	0.6	0.6	1.6	63.7	0.7	149.3
Stomach	–	–	0.2	0.4	0.6	0.8	1.4	70.4	1.0	98.0
Oral	–	0.1	0.3	0.4	0.5	0.5	1.4	71.9	0.5	192.3
Leukemia	–	0.1	0.2	0.3	0.6	0.6	1.4	71.4	1.0	105.3
Pancreas	–	–	0.1	0.3	0.5	0.6	1.2	86.2	1.2	82.6
Melanoma	0.1	0.1	0.2	0.3	0.4	0.4	1.1	90.9	0.3	333.3
Female										
All Cancers	**1.1**	**3.0**	**6.4**	**10.2**	**13.6**	**12.8**	**37.6**	**2.7**	**22.8**	**4.4**
Breast	0.4	1.3	2.5	3.1	3.3	2.6	11.4	8.8	3.8	26.6
Colorectal	0.1	0.2	0.7	1.3	2.4	2.7	6.1	16.3	2.7	37.7
Lung	–	0.2	0.8	1.7	2.2	1.4	5.5	18.1	4.8	20.8
Lymphoma	0.1	0.1	0.3	0.6	0.8	0.9	2.5	39.8	1.3	75.2
Body of Uterus	–	0.1	0.5	0.8	0.8	0.5	2.3	43.5	0.5	192.3
Ovary	0.1	0.1	0.3	0.4	0.5	0.4	1.6	64.5	1.1	91.7
Pancreas	–	–	0.1	0.3	0.5	0.6	1.3	80.0	1.3	77.5
Leukemia	–	–	0.1	0.2	0.4	0.4	1.1	92.6	0.7	140.8
Melanoma	0.1	0.1	0.2	0.2	0.3	0.2	1.0	103.1	0.2	500.0
Kidney	–	0.1	0.1	0.2	0.3	0.3	1.0	103.1	0.2	487.8
Bladder	–	–	0.1	0.2	0.3	0.4	1.0	102.0	0.4	243.9
Stomach	–	–	0.1	0.2	0.3	0.4	0.8	119.0	0.6	156.3
Cervix	0.1	0.2	0.1	0.1	0.1	0.1	0.7	137.0	0.3	370.4
Oral	–	–	0.1	0.2	0.2	0.2	0.6	156.3	0.3	357.1

– Value less than 0.05

Note: The probability of developing cancer is calculated based on age- and gender-specific cancer incidence and mortality rates for Canada in 1998 and on the abridged life tables based on 1996-1998 all cause mortality rates. The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 1998. See *Appendix II: Methods* for details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

POTENTIAL YEARS OF LIFE LOST DUE TO CANCER

Figure 9 shows the rank order of the 12 leading causes of premature death in Canada in 1998 as represented by potential years of life lost (PYLL). This illustrates that cancer was the leading cause of PYLL for men and women: 924,000 potential years were lost as a result of cancer (Table 13), representing 30% of the PYLL resulting from all causes of death. Lung cancer was responsible for 246,000 PYLL, representing 27% of the premature mortality caused by cancer. Diseases of the heart were the second leading cause. Among children aged 0-19, cancer ranked as the sixth leading cause of PYLL after perinatal causes, congenital anomalies, motor vehicle accidents, other accidents and suicide. The total PYLL due to cancer deaths in children aged 0-19 in 1998 was 15,000 years.

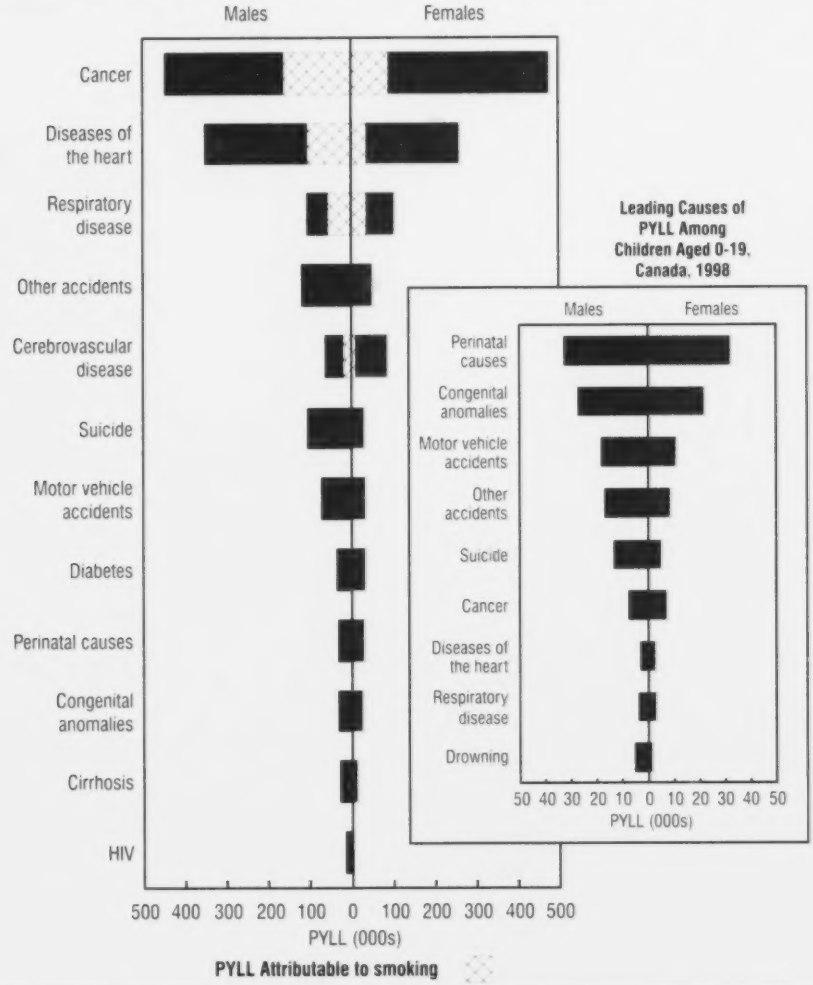
The PYLL due to various types of cancer are presented in Table 13. For men in 1998, the three leading cancers were lung, colorectal and prostate, accounting for 48% of the PYLL due to cancer. The three leading cancers for women were lung, breast and colorectal, accounting for 52% of PYLL due to cancer. The ranking by relative importance of these cancers for men and women with respect to potential years of life lost has been consistent in recent years. For women, however, the PYLL due to lung cancer, which are slightly greater than for breast cancer, reflect the high rates of lung cancer mortality among women aged 50-79. Among men, although prostate cancer is more common than lung cancer, the PYLL due to lung cancer are four times those due to prostate cancer, reflecting higher mortality rates for lung cancer and the younger age at which men develop and die from this disease.

The premature mortality is higher for cancers that are more common, have an earlier age of onset, and more quickly lead to death. With regard to the most common cancers for women and men, the PYLL from breast cancer (94,000) far exceed the PYLL for prostate cancer (33,000), reflecting the relatively young age at which women die from breast cancer. In contrast, the PYLL for Hodgkin's disease, at 3,000, reflect a cancer that is less common and relatively curable.

Although the number of men who die from cancer each year exceeds the number of women, the PYLL for women (478,000) are slightly higher than the PYLL for men (446,000). This is because women generally live longer than men, and some of the deaths due to female cancers occur at younger ages.

The use of tobacco products is the single most important cause of preventable, premature cancer deaths. In addition, many deaths from other diseases also occur because of smoking (Figure 9). Among men, smoking is responsible for almost one-third of PYLL due to all cancers, almost one-quarter of PYLL due to diseases of the heart, and about three-fifths of PYLL due to respiratory disease. Among women, smoking is responsible for about one-fifth of PYLL due to all cancers.

Figure 9
Leading Causes of Potential Years of Life Lost (PYLL), Canada, 1998



Note: Figures are ranked in order of total PYLL for both genders combined and are calculated based on life expectancy. Count and percentage totals may not add due to rounding and to the exclusion of other sites. Childhood cancers are also included within the relevant sites. Smoking attributable PYLL are based on relative risk estimates from follow up of CPS-II cohort and 1996 Canadian smoking prevalence estimates. See *Appendix II: Methods* for details.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 13
Potential Years of Life Lost Due to Cancer, Canada, 1998

	Potential Years of Life Lost (PYLL)					
	Total		Males		Females	
	Years	%	Years	%	Years	%
ALL CAUSES	3,047,000	–	1,646,000	–	1,401,000	–
All Cancers	924,000	100	446,000	100	478,000	100
Childhood Cancer (Ages 0-19)	15,000	1.6	7,500	1.7	7,500	1.6
Cancer Site						
Lung	246,000	26.6	136,000	30.6	110,000	23.0
Breast	94,000	10.1	–	–	94,000	19.6
Colorectal	87,000	9.4	43,000	9.7	44,000	9.2
Pancreas	43,000	4.6	21,000	4.6	22,000	4.7
Non-Hodgkin's Lymphoma	39,000	4.2	21,000	4.7	18,000	3.9
Leukemia	36,000	3.9	20,000	4.6	15,000	3.2
Brain	35,000	3.8	19,000	4.3	16,000	3.4
Prostate	33,000	3.6	33,000	7.4	–	–
Stomach	28,000	3.0	17,000	3.8	11,000	2.3
Ovary	26,000	2.8	–	–	26,000	5.4
Kidney	21,000	2.3	13,000	2.9	8,000	1.7
Oral	17,000	1.9	11,000	2.5	6,000	1.2
Bladder	15,000	1.6	10,000	2.2	5,000	1.0
Multiple Myeloma	14,000	1.6	8,000	1.8	7,000	1.4
Melanoma	14,000	1.5	8,000	1.7	6,000	1.2
Cervix	10,000	1.1	–	–	10,000	2.1
Body of Uterus	10,000	1.1	–	–	10,000	2.0
Larynx	7,000	0.7	5,000	1.2	1,000	0.2
Hodgkin's Disease	3,000	0.3	2,000	0.4	1,000	0.2
Testis	1,000	0.1	1,000	0.3	–	–

– Not applicable

Note: Figures are ranked in order of total PYLL for both genders combined and are calculated based on life expectancy. Count and percentage totals may not add due to rounding and to the exclusion of other sites. Childhood cancers are also included within the relevant sites.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

CANCER IN CHILDREN AND YOUTH AGED 0-19 YEARS

Table 14 shows the number of new cases of cancer with age-standardized incidence rates (1994-1998) and the number of deaths due to cancer with age-standardized mortality rates (1994-1998) for Canadian children aged 0-19. For these periods, cancer was diagnosed in an average of 1,262 children every year, and 239 died each year from their disease. Leukemia accounted for 26% of new cases and 32% of deaths due to cancer in children, and remains the most common of the childhood cancers. Cancers of the brain and spinal cord, the second most common group of childhood cancers, constituted approximately 17% of new cases and 25% of deaths, and lymphomas accounted for 16% of new cases and 8% of deaths.

An indicator of disease prognosis is provided by the ratio of the number of deaths to the number of cases and can be calculated using the data available from Table 14. The deaths to cases ratio for all childhood cancers combined was approximately 0.20. The highest ratios (> 0.27) were found in children with liver (hepatic) cancer, tumours of the sympathetic nervous systems, particularly neuroblastoma, tumours of bone, and tumours of the brain and spinal cord. The high ratio for neuroblastoma reflects the advanced stage at which this disease is frequently diagnosed. Soft tissue sarcomas (0.26), particularly rhabdomyosarcoma (0.32), also have a relatively poor prognosis. The ratio for acute non-lymphocytic leukemia (0.36) was much higher than that observed for acute lymphocytic leukemia (0.13), resulting in a relatively high overall ratio for leukemia. Although the lymphomas have a relatively good prognosis overall, Hodgkin's disease (0.03) has a very low death to cases ratio compared with non-Hodgkin's lymphoma (0.20). The low ratios observed for retinoblastoma and germ cell tumours indicate the low fatality associated with these tumours.

The low death rates for acute lymphocytic leukemia, Hodgkin's disease and germ cell tumours reflect the major advances made in treating these cancers over 30 years. Since the early 1950s, mortality rates for childhood cancer have declined by more than 50%, with most of the improvement occurring after 1970. Improved survival has been particularly dramatic for the most common childhood neoplasm, acute lymphocytic leukemia, as well as for lymphomas and kidney cancer. Although essentially no one survived childhood leukemia 40 years ago,[12] currently, approximately 80% of Canadian children and teenagers with acute lymphoblastic leukemia are alive five years after diagnosis.[13] The improvement in childhood cancer survival relative to that of most adults with cancer reflects biological differences in cancer in adults as compared with children, as well as differences in treatment approaches. The success of clinical trials in identifying new agents and treatment modalities has been significant; a much larger proportion of children than adults with cancer participate in therapeutic trials. As well, a shift towards multi-disciplinary care has improved overall outcomes and decreased morbidity.

Table 14

New Cases and Age-Standardized Incidence Rates (1994-1998), and Deaths and Age-Standardized Mortality Rates (1994-1998), by Histologic Cell Type for Children and Youth Aged 0-19 Years, Canada

Diagnostic Group[2]	New cases (1994-1998)[1]		ASIR per 1,000,000	Deaths (1994-1998)		ASMR per 1,000,000	Deaths: Cases
	Number	%	per year	Number	%	per year	Ratio
Leukemia	**1,650**	**26.2**	**41.55**	**376**	**31.5**	**9.93**	**0.23**
Acute lymphocytic	1,279	20.3	32.15	163	13.6	4.17	0.13
Acute non-lymphocytic	272	4.3	6.87	99	8.3	2.58	0.36
Lymphoma	**995**	**15.8**	**24.71**	**97**	**8.1**	**3.51**	**0.10**
Hodgkin's disease	574	9.1	14.21	16	1.3	0.70	0.03
Non-Hodgkin's lymphoma	414	6.6	10.31	81	6.8	2.81	0.20
Brain and Spinal	**1,065**	**16.9**	**26.74**	**301**	**25.2**	**6.83**	**0.28**
Ependymoma	92	1.5	2.33	38	3.2	0.72	0.41
Astrocytoma	501	7.9	12.54	79	6.6	2.23	0.16
Primitive neuroectodermal	240	3.8	6.05	72	6.0	1.47	0.30
Sympathetic Nervous System	**330**	**5.2**	**8.65**	**90**	**7.5**	**1.26**	**0.27**
Neuroblastoma	318	5.0	8.35	90	7.5	1.26	0.28
Retinoblastoma	**122**	**1.9**	**3.21**	**0**	**0.0**	**0.00**	**0.00**
Renal Tumours	**302**	**4.8**	**7.72**	**33**	**2.8**	**0.69**	**0.11**
Wilm's tumour	278	4.4	7.10	27	2.3	0.45	0.10
Hepatic Tumours	**84**	**1.3**	**2.17**	**24**	**2.0**	**0.54**	**0.29**
Bone	**341**	**5.4**	**8.47**	**100**	**8.4**	**3.74**	**0.29**
Osteosarcoma	178	2.8	4.41	55	4.6	2.18	0.31
Ewing's sarcoma	115	1.8	2.86	41	3.4	1.49	0.36
Soft Tissue	**399**	**6.3**	**10.05**	**105**	**8.8**	**2.96**	**0.26**
Rhabdomyosarcoma	171	2.7	4.30	55	4.6	1.45	0.32
Fibrosarcoma	53	0.8	1.34	6	0.5	0.23	0.11
Germ Cell and Other Gonadal	**402**	**6.4**	**10.09**	**10**	**0.8**	**0.42**	**0.02**
Gonadal germ cell tumours	262	4.2	6.54	1	0.1	0.05	0.00
Carcinoma	**526**	**8.3**	**13.08**	**29**	**2.4**	**1.13**	**0.06**
Thyroid	229	3.6	5.68	1	0.1	0.03	0.00
Melanoma	131	2.1	3.26	9	0.8	0.39	0.07
Other Cancers	**92**	**1.5**	**2.37**	**22**	**1.8**	**0.64**	**0.24**
Total (5 years)	**6,308**	**100.0**	**158.81**	**1,195**	**100.0**	**31.97**	**0.19**
Average Per Year	**1,262**			**239**			

[1] Data are shown for the most recent five-year period available and exclude non-melanoma skin cancer (ICD-9 173) and in-situ carcinomas (ICD-9 230-234). Data are grouped according to the International Classification Scheme for Childhood Cancer, World Health Organization (1996). Rates are age-standardized to the 1991 Canadian population and due to disease rarity are expressed **per million per year**.

[2] Only major subcategories within each group are included. Acute lymphocytic includes all lymphoid, approximately 99% are acute. Non-Hodgkin's lymphomas include Burkitt's lymphoma and unspecified lymphomas. The neuroblastoma category includes ganglioneuroblastoma. Wilm's tumour includes rhabdoid and clear cell sarcoma; rhabdomyosarcoma includes embryonal sarcoma and fibrosarcoma includes other fibromatous neoplasms.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada and Health Statistics Division, Statistics Canada

CANCER INCIDENCE IN YOUNG ADULTS

This section describes cancer patterns in Canadians aged 20-44 years, including identification of the most common types of cancer and description of incidence trends over time. Researchers from across the country came together recently to form the "Cancer in Young Adults in Canada (CYAC) Working Group," which produced a report entitled "Cancer Incidence in Young Adults in Canada: Preliminary Results of a Cancer Surveillance Project".[14] The information in this section is a summary of the more detailed report of the CYAC Working Group.

Although a diagnosis of cancer in young adulthood (ages 20-44) is a relatively rare event, there are important consequences of such a diagnosis. When diagnosed with cancer, these individuals have most of their potential years of life ahead of them, and so may either spend decades living with the effects (physical, reproductive, social, emotional and spiritual) of cancer diagnosis and treatment or have tragically shortened lives, with major repercussions on their families and on society in general.

Cancer Frequency

From 1987 through 1996, 97,469 cancers were diagnosed in young adults. Cancer occurred about twice as often in women as in men aged 20-44: there were 60,803 cancers diagnosed in young adult women and 36,666 in young adult men (Figure 10.1). Restricted to those cancers that occur in both sexes (i.e. excluding cancers of the breast and reproductive system), the numbers are closer, with a slight excess in men (28,426 in women; 31,165 in men). Ten types account for 83% of cancers in young women and 74% in young men. The female breast is the most common site of cancer (n = 20,680), representing 33% of cancers in women. Several other top-ranked cancers arise in the reproductive system: cervix and ovary (ranks 2 and 5, respectively) in women, and testis (rank 1 in men). Although the ranks differ between sexes, some cancers are common in both men and women: non-Hodgkin's lymphoma, melanoma, Hodgkin's disease, and colorectal, lung and brain cancers. Thyroid cancer is much more common in women (n = 4,562) than in men (n = 1,206, not shown).

The rank order of the most frequently diagnosed cancers among older adults, which is also shown in Figure 10.1, is quite distinct from that among young adults. For example, with lung, breast, prostate and colorectal cancers being the three most common among older adults, the only one that is also in the top three among young adults is cancer of the breast, although colorectal and lung cancer are ranked fourth and fifth among young men. The relative contribution of cancer among young adults is presented in Figure 10.2, which demonstrates that the number of cancers in the 20-44 year age group is much less than among older adults.

CANCER INCIDENCE IN YOUNG ADULTS

Cancer Trends in Young Adults

Cancer incidence increased slightly from 1987 to 1996 among both young men (0.7% per year) and young women (0.5% per year). Figure 10.3 shows long-term trends, and Table 15 refers to the most recent decade. The consistent and substantial excess for all cancers combined among young women is evident in Figure 10.3; however, when limited to cancers that occur in both sexes, rates were similar among men and women, with a slight male excess, but with a significantly increasing trend among women (1.4% per year – Table 15).

Figure 10.4 presents time trends for the most common cancers, and indicates that there are important increases for several cancers. Rates increased linearly (and with statistical significance) over time for thyroid cancer in both sexes (6.6% per year among women and 4.2% among men); non-Hodgkin's lymphoma in both sexes (3.5% among women and 4.0% among men); lung cancer in women (1.9% per year); brain cancer in women (2.0% per year); and testis cancer (1.7% per year). Figure 10.4 also represents the male to female rate ratios. Whereas incidence rates were consistently higher among males for Hodgkin's disease and non-Hodgkin's lymphoma, females had higher rates of melanoma and much higher rates of thyroid cancer. Incidence rates are similar for colorectal cancer and lung cancer (in recent years only).

Discussion

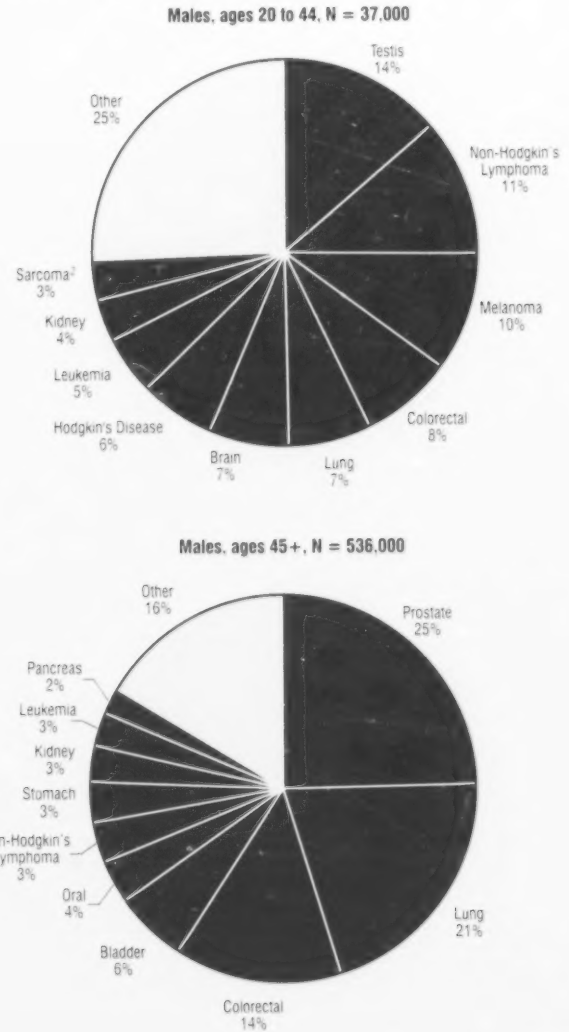
The types of cancer that occur most often in young adults and their relative frequencies are different from those in older adults. Common cancers represent a mix of those that are common in adolescents (Hodgkin's disease), those that are common in older adults (breast, colorectal and lung), and some that are not particularly common in either (melanoma, thyroid).

Several of the cancers that occur commonly in this age group have been increasing in incidence over the nearly 30-year time span of these data, some dramatically (thyroid cancer and non-Hodgkin's lymphoma in both sexes, and lung cancer in women). The reasons for some of these increases have been established (e.g. female lung cancer is related to tobacco use), but for some the reasons are not known (e.g. thyroid cancer).

Overall, cancer occurs relatively infrequently in young adults, and this explains partly why cancer patterns in this age group are monitored less than among both children and the population as a whole. However, more detailed surveillance and review may provide clues to the etiology of cancers that are common in this age group, because there is a relatively short period for exposures to act between the beginning of life and cancer diagnosis, and because those who get cancer at a young age may represent a particularly vulnerable subpopulation. Furthermore, as Sir Richard Doll has emphasized, monitoring cancer in young adults is important for assessing our progress against cancer, because the trends can reflect only recent changes in the prevalence of cancer-causing agents, and young people tend to adopt new habits before the old do.[15] Cancer in this age group may also represent risk among those who are genetically more susceptible to the disease, such as individuals who inherit a cancer predisposition gene (e.g. BRCA 1 or BRCA 2 mutation). The first report of the CYAC Working Group,[14] as summarized here, provides a description of the patterns of cancer among young adults in Canada. In the next phase of their work, these researchers will do more in-depth analyses and will explore possible explanations for the patterns and trends.

Figure 10.1

Frequencies for the Ten Most Common Cancers, ages 20-44 and ages 45+, by Gender, Canada, 1987-1996[1]

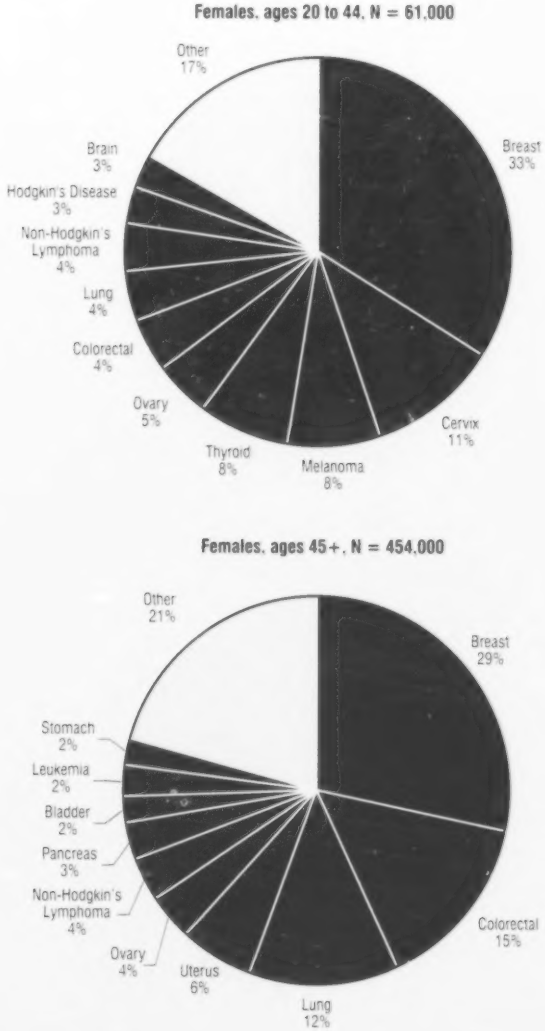


[1] Non-melanoma skin cancers not included.

[2] Bone and connective tissue

Figure 10.1 *(continued)*

Frequencies for the Ten Most Common Cancers, ages 20-44 and ages 45+, by Gender, Canada, 1987-1996[1]



[1] Non-melanoma skin cancers not included.

Figure 10.2
Cancer Frequencies, by Broad Age Group and Gender, Canada, 1987-1996

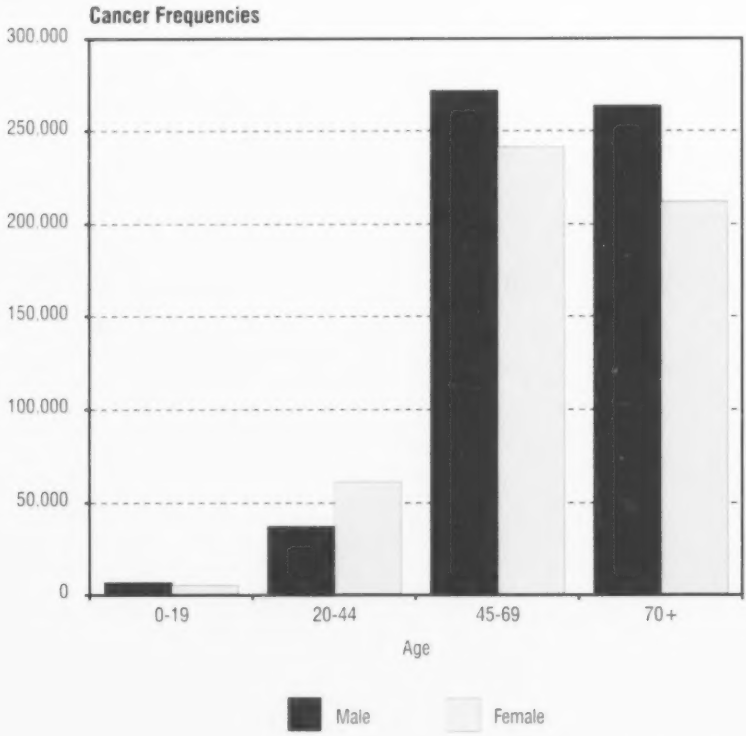
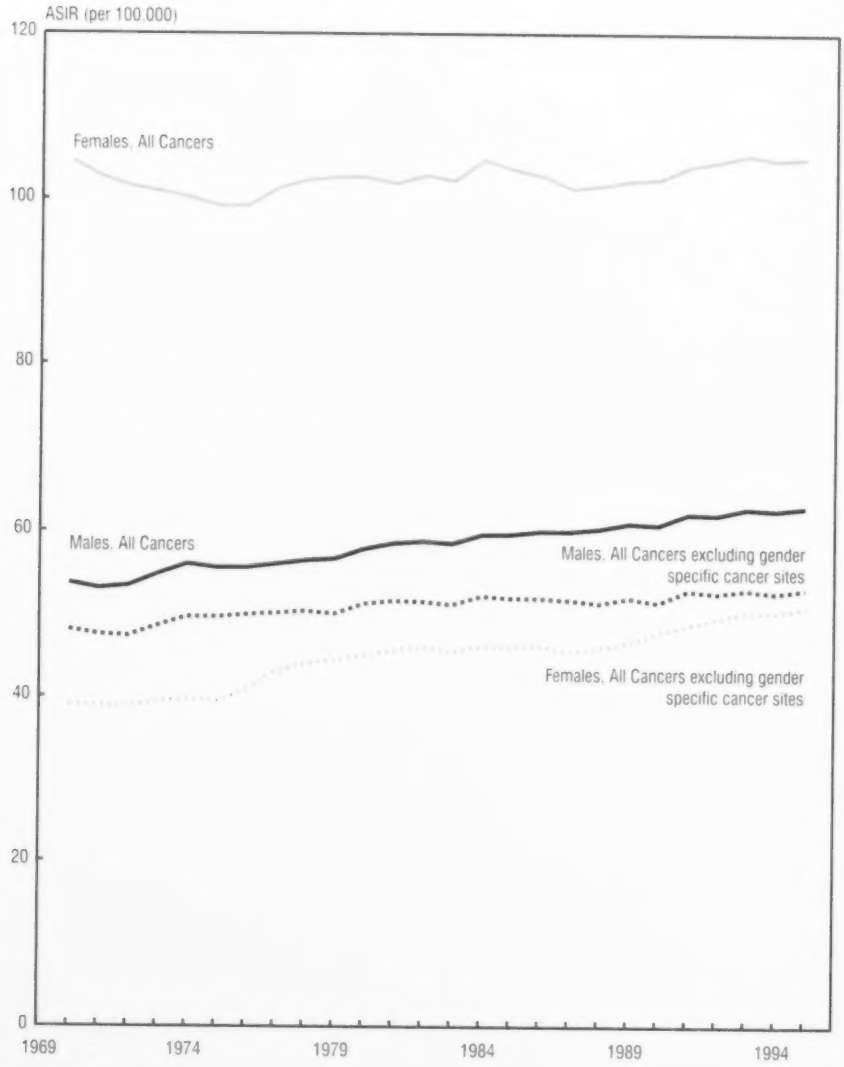


Figure 10.3

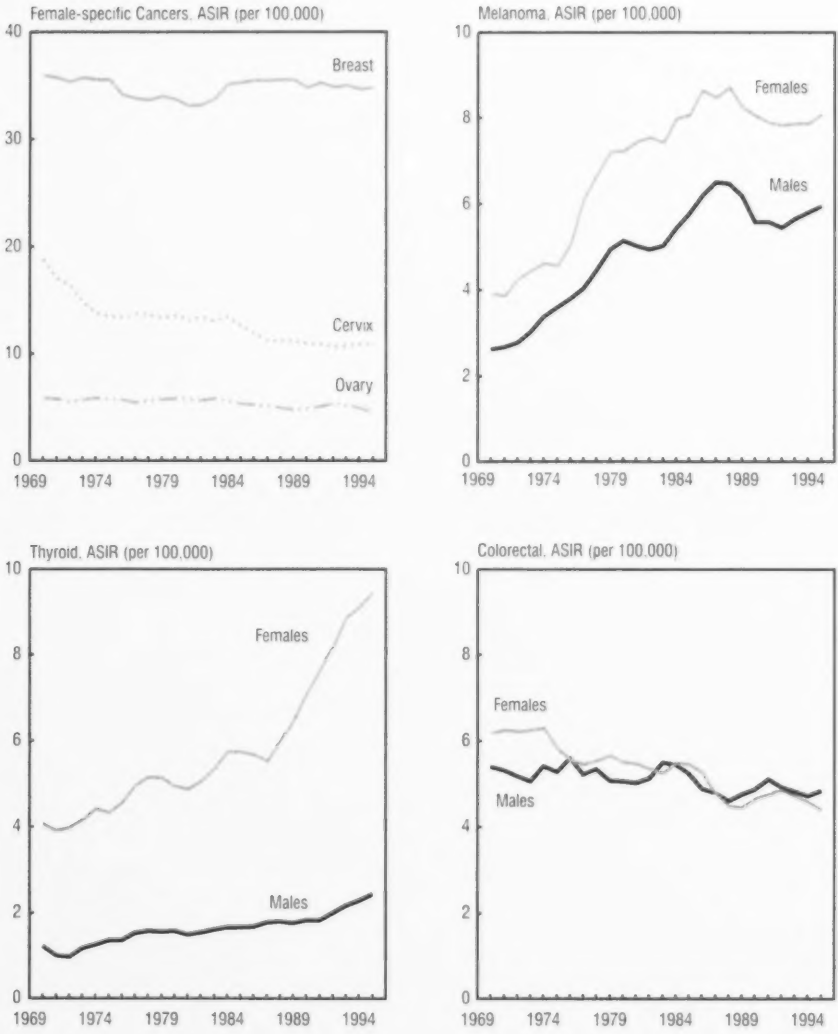
Age-Standardized 3-year Moving Average Incidence Rates (ASIR) for All Cancers and All Cancers Excluding Those Specific to One Gender, in Young Adults (ages 20-44), by Gender, Canada, 1969-1996



Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Figure 10.4

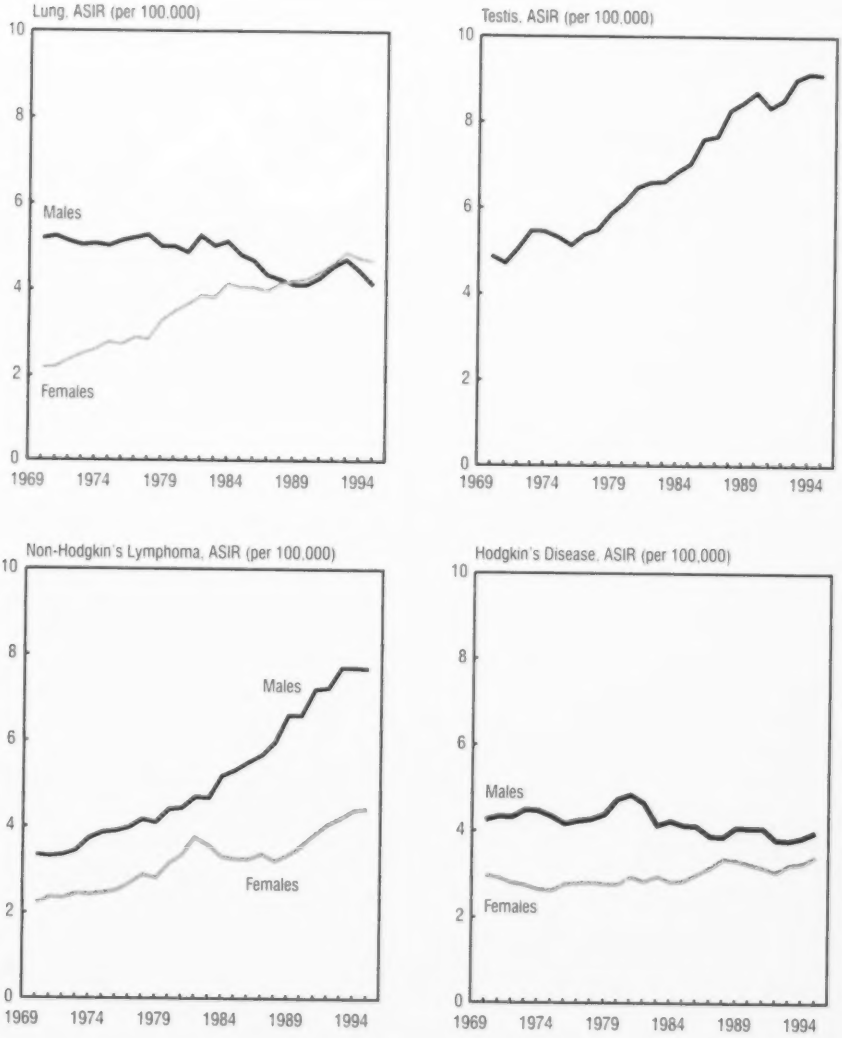
Age-Standardized 3-year Moving Average Incidence Rates (ASIR) for Common Cancers, in Young Adults (ages 20-44), by Gender, Canada, 1969-1996



Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Figure 10.4 ***(continued)***

Age-Standardized 3-year Moving Average Incidence Rates (ASIR) for Common Cancers, in Young Adults (ages 20-44), by Gender, Canada, 1969-1996



Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Table 15

Estimated Average Annual Percent Change in Age-Standardized Incidence Rates for Young Adults (ages 20-44), by Gender and Cancer Site, Canada 1987-1996

	Males	Females
All Cancers[1]	**0.7***	**0.5***
All Cancers, excluding those specific to one gender	0.4	1.4*
Breast	–	-0.2
Melanoma	-1.0	-0.6
Cervix	–	-0.4
Non-Hodgkin's Lymphoma	4.0*	3.5*
Thyroid	4.2*	6.6*
Colorectal	0.2	-0.9
Lung	-0.5	1.9*
Testis	1.7*	–
Hodgkin's Disease	0.2	0.6
Brain	0.6	2.0*
Leukemia	0.0	-0.5
Ovary	–	-0.8

– Not applicable

[1] Figures exclude non-melanoma skin cancer (ICD-9 173).

* Trend is significantly different from 0, with $p < 0.05$.

Note: Rates adjusted to the age distribution of the 1991 Canadian population.

FIVE-YEAR RELATIVE CANCER SURVIVAL IN CANADA, 1992

Population-based cancer survival rates provide one indication of the burden of cancer, and in particular indicate the variation in severity of the different types of cancer. It should be noted, however, that differences in survival across geographic areas and across time may arise from variations in diagnostic techniques, in the use of early-detection strategies, the availability and effectiveness of treatments, and differences in the cancers that occur in a specific population.

Canadian five-year relative survival rates, based on 1992 incidence, for the four most common cancer sites (prostate, breast, colorectal and lung) are presented by age group in Figures 11.1-11.4. Provincial age-standardized relative survival rates are shown in Table 16. Relative survival is the preferred method for analyzing the survival of cancer patients in population-based studies. Relative survival compares the observed survival for a group of cancer patients with the survival of members of the general population who have the same characteristics, such as, age, gender, and province of residence, as the cancer patients. For example, women with a relative survival from breast cancer of 80% are 80% as likely to live another five years as are women of the same age who live in the same province.

The methodology for these analyses and the data presented here are a summary of more detailed survival analysis results published recently by Ellison et al.[16] Data from Quebec have been excluded because its method of ascertaining the date of cancer diagnosis differs from the method for other registries; this makes it difficult to estimate the survival times that are required for this special topic. Prince Edward Island and the territories are included in the national rates but are not presented with the provincial rates because the numbers were too small to permit reliable age-standardization of survival rates.

Five-year relative survival rates for ages 15-99 were highest for prostate cancer (87%), followed by breast cancer (82%), colorectal cancer (56% among men and 59% among women), and lung cancer (14% among men and 17% among women). Age-related patterns of survival vary by cancer site. Men with prostate cancer and women with breast cancer had poorer prognoses at the youngest and oldest ages. Five-year relative survival was 81% for men with prostate cancer under 55 years and 67% for those over 85 years. In comparison, men between the ages of 55 and 74 had survival rates of 89%. Breast cancer relative survival was 73% for those under 40 and 78% for those over 80 years, whereas women from 40-69 years of age had a five-year survival of 83% and those 70-79, 86%. Prostate and breast tumours in young men and women may be genetically or biologically predisposed to be more aggressive.[17-19]

The age-specific patterns showed that colorectal cancer survival remained fairly stable until age 80, which is in contrast to the pattern seen for other cancers. Lung cancer relative survival decreased with advancing age among both men (17% to 8%) and women (24% to 10%), though five-year relative survival was higher among women in all age groups. Possible explanations for the decline in relative survival with increasing age are that older patients may choose not to be treated, or may have disease that is detected at a later stage[20] when treatment is less effective. In addition, physicians are sometimes unable to initiate aggressive treatment in elderly cancer patients because of their frail health and the presence of other medical conditions.[20-23]

Age-standardized relative survival rates for prostate cancer ranged from a low of 67% in Newfoundland to a high of 91% in British Columbia; the rest of the provinces had relative survival rates between 82% and 86%. The provincial pattern for breast cancer

was similar, with British Columbia women having the highest survival rate (85%), and those in Newfoundland the lowest (76%). Although there was little inter-provincial variation in colorectal cancer survival, lower rates were observed in New Brunswick, where age-standardized five-year relative survival rates were 47% among men and 52% among women. Lung cancer relative survival among men varied across the provinces, from a low of 8% in Saskatchewan to a high of 15% in Ontario, New Brunswick, and Manitoba.

There are several possible explanations for the observed variation in the provincial survival rates. These include differential patterns of use and diffusion of screening and early detection technologies; varying patterns of diagnosis; availability and access to cancer treatment; and variations in registry reporting methods. Because of the lack of data on stage of disease at diagnosis and detailed information on methods of diagnosis, the extent to which these differences affected five-year relative survival rates is not known. The possibility also exists that the inter-provincial differences are an artefact due to screening and/or early diagnosis, which may have inflated five-year survival rates without any impact on the actual mortality from the cancer itself.[24] For example, it is likely that at least some of the variation in prostate cancer survival rates among the provinces was due to differing rates of PSA testing for prostate cancer screening, which will diagnose men at an earlier stage of the illness. Similarly, the use of mammography screening for breast cancer may be the source of some of the inter-provincial variation in breast cancer survival.

The inter-provincial differences must, therefore, be interpreted with caution. A recent study demonstrated that population-based, relative survival rates are more closely associated with cancer incidence than mortality.[24] This implies that variation in relative survival rates is more likely an indicator of variation in the disease that occurs and how it is detected, rather than how its outcomes are affected (e.g. by treatment). This is of particular concern in the above survival comparisons, because disease stage was not available in the Canadian databases, thus the impact of the most important prognostic factor could not be accounted for. Accordingly, an appropriate role for these results is that they serve to demonstrate the wide variation in disease severity. Even though the Canadian cancer surveillance system is one of the best in the world, the limitations of the available information also indicate that further improvements in data quality, completeness and access are needed. Only with such developments can the survival patterns be explained, which in turn can support the planning of an enhanced cancer control system.

Figure 11.1
Five-year Relative Survival from Prostate Cancer, Canada*, 1992

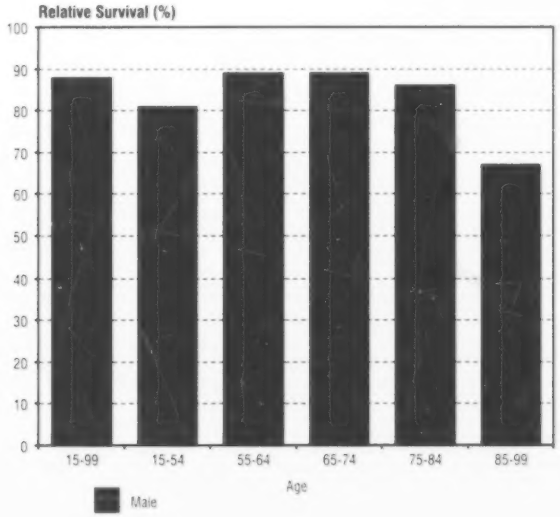
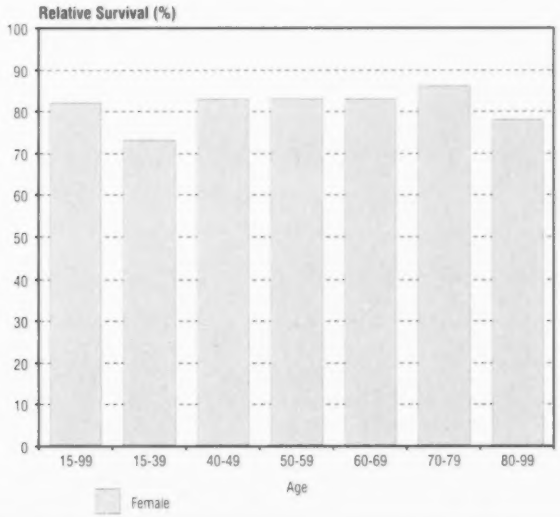


Figure 11.2
Five-year Relative Survival from Breast Cancer, Canada*, 1992



* excluding Quebec.

Figure 11.3
Five-year Relative Survival from Colorectal Cancer, Canada*, 1992

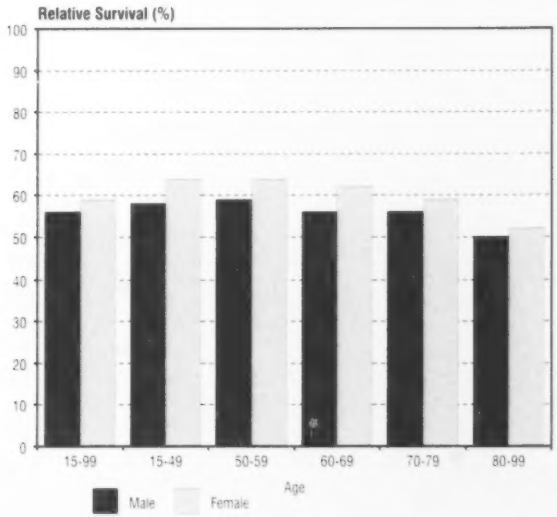
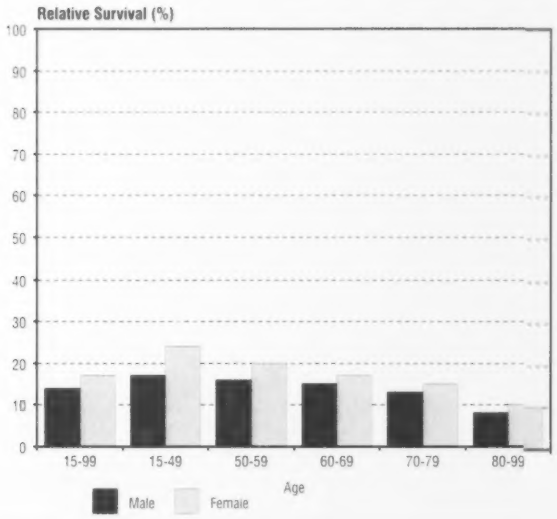


Figure 11.4
Five-year Relative Survival from Lung Cancer, Canada*, 1992



* excluding Quebec.

Table 16
Age-Standardized Five-year Relative Survival Rates, Canada* and Provinces, 1992

Males	Prostate		Colorectal		Lung	
	Relative Survival Rate (%)	95% CI	Relative Survival Rate (%)	95% CI	Relative Survival Rate (%)	95% CI
Canada	**87**	**85, 88**	**56**	**54, 58**	**14**	**13, 15**
Newfoundland†	67	55, 77	56	46, 66	13	8, 20
Nova Scotia	82	75, 87	54	45, 62	13	10, 17
New Brunswick	83	76, 89	47	39, 55	15	11, 20
Ontario	86	84, 88	55	53, 58	15	14, 16
Manitoba	85	80, 89	53	46, 60	15	11, 20
Saskatchewan	83	77, 87	54	46, 61	8	6, 12
Alberta	82	78, 85	54	48, 59	10	7, 13
British Columbia	91	88, 93	59	54, 63	12	10, 15

Females	Breast		Colorectal		Lung	
	Relative Survival Rate (%)	95% CI	Relative Survival Rate (%)	95% CI	Relative Survival Rate (%)	95% CI
Canada	**82**	**81, 83**	**59**	**58, 61**	**17**	**16, 18**
Newfoundland†	76	68, 82	56	46, 65	20	10, 33
Nova Scotia	84	79, 88	56	49, 63	16	11, 23
New Brunswick	77	71, 82	52	43, 60	11	6, 17
Ontario	82	81, 83	59	57, 61	18	17, 20
Manitoba	79	74, 83	60	53, 66	15	10, 20
Saskatchewan	83	78, 86	65	56, 72	17	12, 23
Alberta	81	78, 84	55	49, 60	13	10, 17
British Columbia	85	83, 87	61	56, 65	15	12, 18

* excluding Quebec and PEI

† Please refer to *Appendix II: Methods* for further details.

Age The age of the patient (in completed years) at the time of diagnosis or death.

ICD-9 The Ninth Revision of the International Classification of Diseases[25]

Incidence The number of new cases of a given type of cancer diagnosed during the year. The basic unit of reporting is a new case of cancer rather than an individual patient.

Mortality The number of deaths attributed to a particular type of cancer that occurred during the year. Included are deaths of patients diagnosed in earlier years, persons with a new diagnosis during the year, and patients for whom a diagnosis of cancer is made only after death.

Province/ Territory For cancer incidence and mortality data, this is the province/territory of the patient's permanent residence at time of diagnosis or death, which may or may not correspond to the province/territory in which the new case of cancer or the cancer death was registered.

Incidence and Mortality Rates

Crude rate The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in the population.

Age-specific rate The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in a given age group.

Age-standardized rate The number of new cases of cancer or cancer deaths per 100,000 that would have occurred in the standard population (1991 Canadian population) if the actual age-specific rates observed in a given population had prevailed in the standard population.

Index of age-standardized rates The age-standardized rate of the base year, 1971, is set at 100. Index values for subsequent years are derived by multiplying the age-standardized rate for the year by 100 and then dividing by the 1971 rate.

GLOSSARY

Site Definitions:

Cancer data presented in this monograph are classified according to the following site groupings, except where otherwise noted.

Site	ICD-9	Site	ICD-9
Oral	140-149	Prostate	185
Esophagus/Oesophagus	150	Testis	186
Stomach	151	Bladder	188
Colorectal	153-154	Kidney	189
Pancreas	157	Brain	191-192
Larynx	161	Thyroid	193
Lung	162	Lymphoma	200-203
Melanoma	172	Hodgkin's Disease	201
Female Breast	174	Multiple Myeloma	203
Cervix	180	Non-Hodgkin's Lymphoma	200,202
Body of Uterus	179,182	Leukemia	204-208
Ovary	183	All Cancers excluding Lung	140-208 excluding 173,162
		All Other Cancers	All sites between 150-199 not listed above
All Cancers	**140-208 excluding 173**		

1991 Canadian Population/World Standard Population:

The population used to standardize rates had the following age distribution.

Population			Population			Population		
Age Group	Canadian	World Standard	Age Group	Canadian	World Standard	Age Group	Canadian	World Standard
0-4	6,946.4	12.000	30-34	9,240.0	6.000	60-64	4,232.6	4.000
5-9	6,945.4	10.000	35-39	8,338.8	6.000	65-69	3,857.0	3.000
10-14	6,803.4	9.000	40-44	7,606.3	6.000	70-74	2,965.9	2.000
15-19	6,849.5	9.000	45-49	5,953.6	6.000	75-79	2,212.7	1.000
20-24	7,501.6	8.000	50-54	4,764.9	5.000	80-84	1,359.5	500
25-29	8,994.4	8.000	55-59	4,404.1	4.000	85+	1,023.7	500
						TOTAL		100,000

Source: The Canadian population distribution is based on the final post-censal estimates of the July 1, 1991 Canadian population, adjusted for census undercoverage. The World Standard Population is used in *Cancer Incidence in Five Continents*.[4]

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

The focus of this monograph is on current year estimates that are obtained by analyzing actual data and making short-term projections using statistical techniques (see *Appendix II*). For users who require *actual data* rather than current year *estimates*, the tables in this Appendix provide a summary of actual incidence and mortality statistics based on the most recently available data for the nation. These data represent the most recent year in the long series of data that was used to derive the current year estimates.

Appendix Tables 1 and 2 list the actual number of new cases in 1998 and deaths in 1998 that occurred in Canada, and specify the ICD-9 codes used to define each diagnostic group. Given the reliability of these actual counts, it is feasible to examine the frequency of additional cancer types, thus Appendix Tables 1 and 2 list a larger number of cancer types than the previous tables. Appendix Tables 3 to 6 list actual values for incidence and mortality counts and rates for major cancer types, by province and territory.

In addition to the explanations and discussion provided earlier in the monograph, several other points should be noted. As noted in Tables 3-6 of this Appendix, because of the small populations of the Territories, it was only feasible to provide summaries (5-year average) for the most common cancers. The Appendix Tables also indicate that among provinces there was some variation in the years for which data were available (as of August 2001 when these analyses began). Furthermore, the data sources are dynamic files that are routinely updated as new data become available. Ontario cases have not been linked to the Canadian Cancer Registry for 1997-1998; consequently, there may be a small number of duplications. Users who require more current, actual data for Canada may contact the Surveillance and Risk Assessment Division at Health Canada or the Health Statistics Division at Statistics Canada. The most up-to-date data for individual provinces can be obtained by contacting the provincial cancer registries (see section *For Further Information*).

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table 1
Actual Data for New Cases of Cancer by Site and Gender, Canada, 1998

Site	ICD-9	Total	Males	Females
All cancer sites	**140-208**	**125,781**	**64,456**	**61,325**
Oral (buccal cavity and pharynx)	**140-149**	**2,926**	**2,014**	**912**
Lip	140	467	379	88
Tongue	141	579	387	192
Salivary Gland	142	330	190	140
Floor of Mouth	144	220	155	65
Pharynx	146,147,148	790	587	203
Other and Unspecified	143,145,149	540	316	224
Digestive organs	**150-159**	**27,066**	**14,639**	**12,427**
Esophagus	150	1,177	849	328
Stomach	151	2,851	1,799	1,052
Small Intestine	152	395	210	185
Large Intestine	153	11,284	5,585	5,699
Rectum	154	5,599	3,272	2,327
Liver and Biliary Passages	155,156	2,010	1,103	907
Pancreas	157	3,014	1,474	1,540
Other and Unspecified	158,159	736	347	389
Respiratory system	**160-165**	**20,973**	**12,922**	**8,051**
Larynx	161	1,184	968	216
Lung	162	19,085	11,470	7,615
Other and Unspecified	160,163,164,165	704	484	220
Bone tissue and skin	**170-172**	**4,344**	**2,249**	**2,095**
Bone	170	282	149	133
Connective Tissue	171	801	439	362
Skin (melanoma)	172	3,261	1,661	1,600
Breast	**174,175**	**18,155**	**132**	**18,023**
Genital organs	**179-187**	**24,609**	**17,000**	**7,609**
Cervix	180	1,345	–	1,345
Body of Uterus	182	3,318	–	3,318
Ovary	183	2,310	–	2,310
Prostate	185	16,168	16,168	–
Other and Unspecified	179,181,184,186,187	1,468	832	636
Urinary organs	**188-189**	**8,122**	**5,534**	**2,588**
Bladder	188	4,571	3,335	1,236
Kidney and Other Urinary	189	3,551	2,199	1,352
Eye	**190**	**263**	**135**	**128**
Brain and central nervous system	**191-192**	**2,190**	**1,214**	**976**
Endocrine glands	**193-194**	**1,863**	**486**	**1,377**
Thyroid	193	1,717	420	1,297
Other Endocrine	194	146	66	80
Leukemia	**204-208**	**3,354**	**1,906**	**1,448**
Other blood and lymph tissues	**200-203**	**7,713**	**4,165**	**3,548**
Hodgkin's Disease	201	765	422	343
Multiple Myeloma	203	1,617	880	737
Non-Hodgkin's Lymphoma	200, 202	5,331	2,863	2,468
All other and unspecified sites	**195-199**	**4,203**	**2,060**	**2,143**

– Not applicable

Note: ICD-9 refers to the Ninth Revision of the International Classification of Diseases. Figures exclude non-melanoma skin cancer (ICD-9 173). Further information is available at: http://www.hc-sc.gc.ca/pphb-dgspsp (select Disease Surveillance On-Line).

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 2
Actual Data for Cancer Deaths by Site and Gender, Canada, 1998

Site	ICD-9	Total	Males	Females
All cancer sites	**140-208**	**60,603**	**32,395**	**28,208**
Oral (buccal cavity and pharynx)	**140-149**	**1,022**	**679**	**343**
Lip	140	19	14	5
Tongue	141	243	153	90
Salivary Gland	142	89	57	32
Floor of Mouth	144	37	24	13
Pharynx	146,147,148	307	217	90
Other and Unspecified	143,145,149	327	214	113
Digestive organs	**150-159**	**16,131**	**8,798**	**7,333**
Esophagus	150	1,288	953	335
Stomach	151	1,953	1,213	740
Small Intestine	152	129	70	59
Large Intestine	153	4,996	2,544	2,452
Rectum	154	1,417	817	600
Liver and Biliary Passages	155,156	1,714	957	757
Pancreas	157	3,007	1,481	1,526
Other and Unspecified	158,159	1,627	763	864
Respiratory system	**160-165**	**16,928**	**10,533**	**6,395**
Larynx	161	460	390	70
Lung	162	16,268	10,018	6,250
Other and Unspecified	160,163-165	200	125	75
Bone tissue and skin	**170-172**	**1,167**	**654**	**513**
Bone	170	128	75	53
Connective Tissue	171	367	174	193
Skin (melanoma)	172	672	405	267
Breast	**174,175**	**4,904**	**31**	**4,873**
Genital organs	**179-187**	**6,318**	**3,740**	**2,578**
Cervix	180	405	–	405
Body of Uterus	182	342	–	342
Ovary	183	1,413	–	1,413
Prostate	185	3,664	3,664	–
Other and Unspecified	179,181,184,186,187	494	76	418
Urinary organs	**188-189**	**2,719**	**1,799**	**920**
Bladder	188	1,380	962	418
Kidney and Other Urinary	189	1,339	837	502
Eye	**190**	**37**	**19**	**18**
Brain and central nervous system	**191-192**	**1,523**	**862**	**661**
Endocrine glands	**193-194**	**252**	**110**	**142**
Thyroid	193	174	71	103
Other Endocrine	194	78	39	39
Leukemia	**204-208**	**2,038**	**1,178**	**860**
Other blood and lymph tissues	**200-203**	**3,572**	**1,956**	**1,616**
Hodgkin's Disease	201	118	69	49
Multiple Myeloma	203	1,054	605	449
Non-Hodgkin's Lymphoma	200, 202	2,400	1,282	1,118
All other and unspecified sites	**173,195-199**	**3,992**	**2,036**	**1,956**

– Not applicable

Note: ICD-9 refers to the Ninth Revision of the International Classification of Diseases.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table 3

Actual Data for New Cases for Major Cancer Sites by Gender and Geographic Region, Most Recent Year,[1] Canada

	New Cases												
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**64,500**	**910**	**340**	**2,400**	**1,850**	**15,700**	**24,500**	**2,600**	**2,400**	**5,400**	**9,200**	**35**	**35**	**20**
Prostate	16,200	270	85	660	510	2,800	6,600	660	760	1,650	2,900	5	5	–
Lung	11,500	120	55	490	380	3,600	3,900	420	370	820	1,350	5	5	10
Colorectal	8,900	200	50	330	240	2,200	3,300	370	300	700	1,200	5	10	5
Bladder	3,300	20	15	80	55	1,150	1,150	90	120	130	360	–	–	–
Non-Hodgkin's Lymphoma	2,900	35	15	100	80	690	1,100	110	100	250	400	–	5	–
Kidney	2,200	30	15	85	75	560	870	120	75	220	240	–	–	–
Oral	2,000	–	10	75	50	480	780	100	70	180	230	–	–	–
Leukemia	1,900	25	15	60	55	470	740	80	95	190	230	–	–	–
Stomach	1,800	65	10	70	40	470	670	75	65	140	210	–	–	–
Melanoma	1,650	–	15	100	65	210	750	75	65	210	270	–	–	–
Pancreas	1,450	15	10	55	50	430	480	70	45	100	240	–	–	–
Brain	1,200	30	10	35	35	330	460	50	45	95	170	–	–	–
Larynx	970	–	5	25	30	330	320	30	25	50	120	–	–	–
Multiple Myeloma	880	5	5	25	20	220	370	35	25	55	120	–	–	–
Females														
All Cancers	**61,300**	**750**	**280**	**2,200**	**1,600**	**15,700**	**23,400**	**2,500**	**2,100**	**5,100**	**7,900**	**35**	**35**	**20**
Breast	18,000	260	85	620	470	4,700	6,700	740	610	1,650	2,500	15	10	–
Colorectal	8,000	150	40	300	240	2,100	3,100	340	280	520	970	–	5	–
Lung	7,600	60	50	310	220	2,000	2,800	310	270	590	1,000	5	5	5
Body of Uterus	3,400	55	10	120	90	860	1,300	170	120	310	420	–	–	–
Non-Hodgkin's Lymphoma	2,500	20	5	80	90	600	960	110	100	190	310	–	–	–
Ovary	2,300	25	10	75	40	570	960	70	65	140	290	–	–	–
Melanoma	1,600	–	15	100	80	220	670	45	60	210	240	–	–	–
Pancreas	1,550	5	10	70	45	430	530	50	45	120	220	–	–	–
Leukemia	1,450	20	5	35	35	340	610	65	65	120	190	–	–	–
Cervix	1,350	5	5	60	35	280	480	50	55	130	180	–	–	–
Kidney	1,350	20	5	65	35	360	510	60	60	120	150	–	–	–
Thyroid	1,300	10	–	30	25	290	600	55	35	120	130	–	–	–
Bladder	1,250	–	–	40	10	430	430	20	55	45	110	–	–	–
Stomach	1,050	15	–	30	30	310	370	35	40	90	120	–	–	–
Brain	980	15	5	30	25	270	400	45	35	75	130	–	–	–
Oral	910	5	5	25	15	230	340	40	25	70	130	–	–	–
Multiple Myeloma	740	5	5	25	20	190	330	40	25	35	95	–	–	–

– Fewer than 3 cases

[1] 1998 for Canada, Quebec, Ontario; 1999 for Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Saskatchewan, Alberta, British Columbia; 1995-1999 average for Yukon, Northwest Territories, Nunavut

Note: Total of rounded numbers may not equal rounded total number and an average is used for the territories. Counts exclude cases of non-melanoma skin cancer (ICD-9 173).

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 4

Actual Age-Standardized Incidence Rates for Major Cancer Sites by Gender and Geographic Region, Most Recent Year,[1] Canada

	Rate per 100,000													
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**446**	**344**	**493**	**517**	**489**	**456**	**448**	**443**	**440**	**438**	**446**	**354**	**355**	**432**
Prostate	114	104	122	140	137	83	122	114	137	136	143	59	54	–
Lung	79	46	76	105	103	105	70	72	67	67	66	84	72	187
Colorectal	61	74	71	69	63	63	60	64	54	57	58	56	90	101
Bladder	23	8	21	17	14	34	21	15	21	11	18	–	–	–
Non-Hodgkin's Lymphoma	19	13	22	22	21	19	20	18	19	19	19	–	23	–
Kidney	15	11	23	18	20	16	16	21	14	17	11	–	–	–
Oral	13	–	15	16	13	13	14	17	13	14	11	–	–	–
Stomach	13	24	13	14	11	14	12	13	12	12	10	–	–	–
Leukemia	13	9	20	13	15	14	14	14	18	15	11	–	–	–
Melanoma	11	–	23	21	16	6	13	13	12	15	13	–	–	–
Pancreas	10	5	16	11	13	13	9	12	8	8	11	–	–	–
Brain	8	10	11	8	9	9	8	9	9	7	8	–	–	–
Larynx	7	–	7	5	8	9	6	5	5	4	6	–	–	–
Multiple Myeloma	6	2	5	5	6	7	7	6	5	4	6	–	–	–
Females														
All Cancers	**345**	**243**	**336**	**372**	**351**	**349**	**350**	**359**	**340**	**343**	**324**	**347**	**323**	**441**
Breast	103	84	101	105	102	106	101	110	100	110	102	107	87	–
Lung	43	20	63	51	48	44	41	46	43	41	41	49	46	215
Colorectal	43	49	43	48	49	44	44	45	40	35	38	–	72	–
Body of Uterus	19	17	13	20	19	19	19	26	20	22	17	–	–	–
Non-Hodgkin's Lymphoma	14	7	7	14	20	13	14	16	15	13	13	–	–	–
Ovary	13	8	12	13	9	13	15	10	11	9	12	–	–	–
Melanoma	9	–	22	19	19	5	10	7	10	14	10	–	–	–
Pancreas	8	2	7	11	8	9	7	6	6	8	9	–	–	–
Cervix	8	2	8	12	8	7	8	8	11	9	8	–	–	–
Thyroid	8	3	–	6	7	7	10	9	7	8	6	–	–	–
Kidney	8	8	7	11	7	8	8	8	9	8	6	–	–	–
Leukemia	8	6	4	6	8	8	9	10	11	8	8	–	–	–
Bladder	7	–	–	6	2	9	6	3	9	3	4	–	–	–
Stomach	6	5	–	5	6	6	5	4	6	6	5	–	–	–
Brain	6	5	6	5	6	6	6	7	6	5	6	–	–	–
Oral	5	1	5	4	3	5	5	6	4	5	6	–	–	–
Multiple Myeloma	4	1	3	4	4	4	5	5	3	2	4	–	–	–

– Age-standardized incidence rate is based on fewer than 3 cases per year

[1] 1998 for Canada, Quebec, Ontario; 1999 for Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Saskatchewan, Alberta, British Columbia; 1995-1999 average for Yukon, Northwest Territories, Nunavut

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are adjusted to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table 5
Actual Data for Deaths for Major Cancer Sites by Gender and Geographic Region, Canada, 1998[1]

	New Cases													
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**32,400**	**620**	**160**	**1,200**	**980**	**8,900**	**11,600**	**1,400**	**1,250**	**2,300**	**3,900**	**15**	**20**	**15**
Lung	10,000	190	55	380	330	3,300	3,300	400	320	620	1,100	5	5	5
Prostate	3,700	60	15	150	130	760	1,350	190	220	330	450	–	–	–
Colorectal	3,400	70	20	90	75	1,050	1,200	160	120	240	330	–	–	–
Pancreas	1,500	30	5	50	50	400	500	60	60	130	190	–	–	–
Non-Hodgkin's Lymphoma	1,300	15	10	50	35	290	500	60	50	95	170	–	–	–
Stomach	1,200	55	5	35	40	350	400	45	40	80	160	–	–	–
Leukemia	1,200	15	5	30	25	290	470	40	50	95	160	–	–	–
Bladder	960	25	5	30	25	250	350	50	40	75	120	–	–	–
Brain	860	20	–	25	25	250	300	30	40	65	110	–	–	–
Kidney	840	15	5	35	30	230	290	35	30	60	100	–	–	–
Oral	680	10	5	25	15	210	260	25	20	30	80	–	–	–
Multiple Myeloma	610	10	5	25	15	130	230	25	30	40	90	–	–	–
Melanoma	410	5	5	20	10	75	170	15	15	30	70	–	–	–
Larynx	390	5	–	20	10	130	150	10	15	20	40	–	–	–
Females														
All Cancers	**28,200**	**490**	**140**	**1,100**	**760**	**7,500**	**10,400**	**1,200**	**1,000**	**2,000**	**3,600**	**15**	**15**	**10**
Lung	6,200	75	35	250	170	1,700	2,200	260	190	390	920	5	5	5
Breast	4,900	90	30	190	160	1,300	1,750	210	150	350	600	–	–	–
Colorectal	3,100	50	10	120	80	1,000	1,050	130	100	180	300	–	–	–
Pancreas	1,550	20	15	60	40	390	540	70	75	120	200	–	–	–
Ovary	1,400	20	5	40	40	330	560	50	60	110	200	–	–	–
Non-Hodgkin's Lymphoma	1,100	15	5	45	20	270	430	70	40	75	150	–	–	–
Leukemia	860	15	5	30	20	210	350	30	30	65	110	–	–	–
Stomach	740	30	–	25	15	230	240	20	30	60	75	–	–	–
Brain	660	10	5	20	20	220	230	15	20	50	75	–	–	–
Body of Uterus	630	10	–	35	10	170	230	30	25	50	75	–	–	–
Kidney	500	10	–	20	25	140	150	25	20	45	65	–	–	–
Multiple Myeloma	450	5	–	20	15	110	190	15	25	30	45	–	–	–
Bladder	420	10	–	15	10	130	150	10	25	25	50	–	–	–
Cervix	410	10	–	20	15	90	170	10	10	45	40	–	–	–
Oral	340	5	–	10	5	85	140	20	5	35	40	–	–	–
Melanoma	270	5	–	10	5	45	120	15	10	25	40	–	–	–

– Fewer than 3 deaths

[1] 1994-1998 average for Yukon, Northwest Territories, Nunavut

Note: Total of rounded numbers may not equal rounded total number and an average is used for the territories.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Table 6

Actual Age-Standardized Mortality Rates for Major Cancer Sites by Gender and Geographic Region, Canada, 1998[1]

	Rate per 100,000												
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**230**	**249**	**232**	**254**	**267**	**267**	**219**	**238**	**219**	**204**	**198**	**241**	**216**	**312**
Lung	70	75	84	81	89	97	61	69	57	54	55	84	67	118
Prostate	28	26	24	33	37	26	27	32	36	31	24	–	–	–
Colorectal	24	28	26	19	20	32	23	28	21	21	17	–	–	–
Pancreas	10	13	9	11	13	12	9	10	11	11	10	–	–	–
Stomach	9	21	5	8	11	11	8	8	7	7	8	–	–	–
Non-Hodgkin's Lymphoma	9	6	14	11	10	8	9	11	9	8	9	–	–	–
Leukemia	8	6	6	7	7	8	9	7	9	8	8	–	–	–
Bladder	7	10	6	6	7	8	7	8	7	7	6	–	–	–
Brain	6	6	–	5	7	7	5	5	7	5	5	–	–	–
Kidney	6	6	4	8	8	7	5	6	6	5	5	–	–	–
Oral	5	3	6	5	4	6	5	4	3	3	4	–	–	–
Multiple Myeloma	4	4	6	6	4	4	4	4	5	3	5	–	–	–
Larynx	3	2	–	4	2	4	3	2	2	2	2	–	–	–
Melanoma	3	1	4	4	2	2	3	2	2	3	3	–	–	–
Females														
All Cancers	**151**	**157**	**164**	**176**	**154**	**160**	**147**	**158**	**144**	**140**	**142**	**175**	**186**	**268**
Lung	35	26	42	41	35	38	32	35	30	28	38	41	51	155
Breast	26	29	31	31	32	28	25	28	23	25	24	–	–	–
Colorectal	16	17	9	17	15	21	15	16	14	12	11	–	–	–
Pancreas	8	6	14	10	8	8	8	9	10	8	8	–	–	–
Ovary	8	7	8	7	8	7	8	7	9	7	8	–	–	–
Non-Hodgkin's Lymphoma	6	4	5	7	4	6	6	10	6	5	6	–	–	–
Leukemia	5	4	6	5	4	4	5	4	4	4	4	–	–	–
Stomach	4	10	–	4	3	5	3	3	4	4	3	–	–	–
Brain	4	3	7	4	4	5	4	2	3	3	3	–	–	–
Body of Uterus	3	3	–	5	2	4	3	4	4	4	3	–	–	–
Kidney	3	3	–	4	5	3	2	3	3	3	2	–	–	–
Oral	2	1	–	2	1	2	2	2	1	2	2	–	–	–
Cervix	2	3	–	4	3	2	3	1	1	3	2	–	–	–
Bladder	2	3	–	2	2	3	2	1	3	1	2	–	–	–
Multiple Myeloma	2	2	–	3	3	2	3	2	3	2	2	–	–	–
Melanoma	1	1	–	2	1	1	2	2	1	2	2	–	–	–

– Age-standardized mortality rate is based on fewer than 3 cases per year

[1] 1994-1998 average for Yukon, Northwest Territories, Nunavut

Note: Rates are adjusted to the age distribution of the 1991 Canadian population.

Source: Surveillance and Risk Assessment Division, CCDPC, Health Canada

Data Sources and Processing

The actual cancer incidence and mortality data used in this monograph were obtained from four sources: mortality data files (1950-1998),[26,27] the National Cancer Incidence Reporting System (NCIRS, 1969-1991),[1] the Canadian Cancer Registry (CCR, 1992-1999)[3] (the Health Statistics Division at Statistics Canada maintains all these databases) and the Ontario Cancer Registry (Ontario cancer incidence data for 1997-1998).

Actual incidence and mortality data were available for all the provinces and territories for the period 1969 to 1998. In addition, 1999 incidence data were available for all provinces and territories except Ontario and Quebec.

Records from each province were extracted and then classified by gender, age group and selected cancer site as defined in the *Glossary*. Canada totals for selected sites were then determined as the sum of the 10 provinces and three territories.

Population figures for Canada, the provinces and the territories were taken from intercensal estimates for the period 1971 to 1997,[28,29] from postcensal estimates for the period 1998-2000,[29] and from the Scenario 2 population projections for 2001 and 2002.[29] The population estimates from 1971 to 2000 and the population projections include non-permanent residents as part of the population. In addition, adjustments are made for net census undercoverage and returning Canadians, and the reference date for the annual estimates is July 1 instead of June 1. The population projections incorporate assumptions of natural increase, immigration and internal migration, which closely reflect the Canadian reality. These assumptions are regularly updated to take into account the most recent changes.

Incidence and mortality estimates for 2002 were extrapolated from models that were fitted to a subset of the data described above. The data series were selected so that they begin in 1986 for both incidence and mortality. This allows consistency between the mortality and incidence estimates and ensures that the estimates accurately account for current trends. For mortality estimates, data from 1986 to 1998 were used. For incidence estimates, data from 1986 to the latest year of available data were used.

Actual incidence and mortality rates for each province/territory, gender, site and year were computed by dividing the number of cases by the corresponding provincial/territorial population figures. These rates were computed for the "under 45" and the "45 and over" age groups separately. In order to study the age distributions for all cancers and for the leading types of cancer (lung, colorectal, prostate and breast), age-specific rates were computed for the age groups 0-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80 years and over.

Age-standardized incidence and mortality rates for each site were calculated using the age distribution of the 1991 Canadian population. The World Standard Population[4] was used in publications prior to 1995. It was replaced because it is much younger than the 1991 Canadian population. Consequently, estimates of age-standardized rates prior to 1995 are not comparable with later estimates.

Commencing with the 2000 edition of *Canadian Cancer Statistics*, the Northwest Territories represents a different geographic area than in the past. Its geographic boundaries were redrawn, reducing the land area representing the Northwest Territories, and a new territory named Nunavut was incorporated.[30]

APPENDIX II: METHODS

For all cancers, even those with poor survival such as pancreas and lung, the annual number of incident cases is expected to be similar to or larger than the number of deaths. However, there are situations in which the number of deaths either observed or projected is larger than the corresponding number of new cases. In the case of Newfoundland, this is caused by the Registry not receiving information on all death certificates with mention of cancer, which results in an underestimate of the number of cases for the years used to generate the estimates. The Newfoundland Registry is now receiving information in order to register these cases, so this difference will eventually disappear. Deaths may correspond to cases diagnosed in previous years, so year to year variation is also a factor for rare cancer sites.

Incidence Estimates (New Cases) for 2002

The number of new cases was estimated for each age group, cancer site and gender by fitting Poisson regression models to the provincial and territorial yearly values. The assumption underlying Poisson regression is that the annual incidence counts are independent Poisson random variables with a mean equal to the product of the population size for a particular year and the (true) annual incidence rate. For each province and territory, age group, gender and site, a separate model for crude incidence rates was used, with year as the only independent variable. The estimates for 2002 were obtained by multiplying the extrapolated crude incidence rates with the demographic projections for the same year. Since longer data series for some provinces were available, estimates for Canada were computed as the sum of the estimates for the provinces and territories.

Occasionally, when the original data show large fluctuations, it has been impossible to obtain results of satisfactory precision from the model. For these exceptions, new cases for 2002 were estimated (after consultation with the provinces) by a five-year average of the most recent available data: Newfoundland (male — prostate, oral, pancreas, melanoma; female — oral, pancreas, melanoma, cervix); Prince Edward Island (male — oral, stomach; female — all cancers, breast, lung, colorectal); New Brunswick (male — non-Hodgkin's lymphoma, kidney; female — pancreas, thyroid, non-Hodgkin's lymphoma); Quebec (female — lung); Ontario (male — thyroid; female — thyroid); Manitoba (male — prostate, melanoma, non-Hodgkin's lymphoma, kidney; female — melanoma, lung, kidney); Saskatchewan (males – all cancers; female — colorectal); and Alberta (female — Hodgkin's disease).

Prostate cancer incidence projection methodology was modified this year, as the anticipated decline in age-standardized rates from a peak in 1993 was observed until 1995, at which point a new and increasing trend was established. This observation in the summary rates does not apply to the age-specific rates. Since 1981, the age-specific rates for Canada among 0-39 year olds have revealed little change and shown no trend; among 40-59 year olds a steeply increasing trend started around 1991 and has yet to change course; for the 60-74 year olds the rates follow the trends in the age-standardized rates from 1991 on; and for men over 75 years of age the brief spike in rates in the early to mid 1990s was followed by a steep decline to levels at or below the 1981 levels. Consequently, age-specific rate projections based on a Poisson regression model fit to data between 1981 and 1989 were abandoned in favor of Poisson regression models fit to data from 1991 to the most recent year of incidence data available (1998 for Ontario and Quebec, otherwise 1999). The provinces for which this method was applied include Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta and British Columbia.

Bladder cancer incidence counts were in error for the 1999 reporting year. For all provinces and territories except Quebec and Ontario, 2002 estimates were derived from the five-year average rates based on data from 1994 to 1998. The error was detected during systematic review of the "CCR Summary Review Tables" sent to all provincial and territorial cancer registries and will be corrected for next year. Bladder NOS tumours (C67.9, 8130/3) were incorrectly coded to ICD-9 code 233.7 (in situ bladder) instead of ICD-9 code 188.9 (malignant neoplasm of bladder, part unspecified) for 1999 records only. Also, two 1999 tumour records (C679 and 8130/1) were re-coded to ICD-9 code 2367 and not ICD-9 code 2337. Note: The ICD9/ICDO2 concordance error was the result of a CCR systems maintenance operation undertaken last year to update SEER conversion codes changes.

The estimates of incidence counts for "all cancers" were computed as the sum of the estimated prostate cancer cases plus the estimate of "all cancers less prostate" using the standard linear model (based on data from 1986 onwards).

Mortality Estimates (Deaths) for 2002

The number of deaths was estimated for each age group, site and gender using a method similar to that used for incidence. For each province and territory, a linear model was used for death rates, with year as the only independent variable. Mortality counts by cancer site for Canada were obtained from the estimates of the provincial and territorial counts.

Mortality for colorectal cancer is based on ICD-9 codes 153-154 to be consistent with other publications. However, this underestimates colorectal cancer mortality by about 10%, because most deaths registered as ICD-9 code 159.0 (intestine not otherwise specified) are cases of colorectal cancer. These cases will be added to colorectal cancer mortality in the next edition of this publication.

In cases in which the original data show large fluctuations, it has been impossible to obtain results of satisfactory precision from the model. For these exceptions, deaths for 2002 were estimated (after consultation with the provinces) by a five-year average of the most recent available data or the estimate provided by the province: Prince Edward Island (male — pancreas; female — pancreas); New Brunswick (female — lung); Manitoba (male — stomach, kidney; female —lung, ovary); Alberta (males — stomach, thyroid; female — stomach, thyroid).

Estimated Age-Standardized Incidence Rates (ASIRs) and Mortality Rates (ASMRs) for 2002

Incidence and mortality rates were generally estimated using weighted least squares regression, with **some exceptions as noted below**. Weights were taken as the inverse of the estimated variances of the actual age-standardized rates. Variances were calculated under the assumption that the age-specific counts used in the computation of the age-standardized rates follow independent Poisson distributions. Regressions were performed for Canada and each province or territory for each site and gender using a linear model, with year as the only independent variable.

Again, in cases in which the original data show large fluctuations, it has been impossible to obtain from the model results of satisfactory precision. For this reason and to maintain consistency between the age-specific and age-standardized estimates, annual age-standardized incidence rates for 2002 were estimated by actual age-standardized

incidence rates calculated over a five-year period for each of those cases cited above in the Incidence Estimates section. Similarly, annual age-standardized mortality rates for 2002 were estimated by actual age-standardized mortality rates calculated over a five-year period for each of the areas and site combinations listed in the Mortality Estimates section.

Prostate cancer incidence projection methodology was modified this year, as the anticipated decline in age-standardized rates from a peak in 1993 was observed until 1995 at which point a new and increasing trend has been established. However, this new trend has not aligned with the level that was projected based on a linear model fit to the 1981-1989 data. Several options were explored, and we believe the most accurate projections were obtained by simply computing the age-standardized rate from the projected age-specific counts (discussed above). As for the projection of incidence counts, the provinces for which this method for estimating rates was applied include Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta and British Columbia.

Accuracy and Precision of Estimates

The accuracy of an estimate relates to the question of bias: whether or not an estimate is targeting the value of interest. The precision of an estimate refers to the fact that any estimate has a certain variability to it; one cannot "know" an estimate exactly, and therefore the estimate serves only to provide insight into the real unknown value of interest.

The standard error and coefficient of variation, as well as the confidence interval, are calculated to evaluate the precision of each estimate. The standard error is an estimate of the extent to which an estimate will vary, while the coefficient of variation relates this variation to the actual size of the quantity being estimated. Confidence intervals use the standard error to create a range of plausible values for the quantity being estimated. These values are available upon request from the Centre for Chronic Disease Prevention and Control, Health Canada. Together, these quality measures assess the precision (or imprecision) of a particular estimate but not the accuracy of the estimate. Note that any estimates are subject to error, and the degree of precision depends primarily on the number of observed cases and the population size for each site-gender-province combination, while the accuracy is related to the adequacy of the model used in the estimation process.

Because of changes and improvements in the cancer incidence data provided by the provinces, as well as changes in the population estimates and the methodology for producing the estimates of cancer incidence and deaths, estimates in the 2002 report may not be directly comparable with those published in previous years. More detailed information on these methods can be found in technical papers available from Statistics Canada.[31,32]

Estimates of incidence and mortality have been rounded as follows: counts between 0 and 99 to the nearest 5, counts between 100 and 999 to the nearest 10, counts between 1000 and 1999 to the nearest 50 and counts greater or equal to 2000 to the nearest 100. Percentages, age-standardized and age-specific rates were rounded to the nearest tenth except in Tables 4 and 6 and Appendix Tables 4 and 6, where space restrictions forced rounding to the nearest whole number. Age- and gender-specific counts/rates are combined prior to rounding, so it is possible that totals in the tables do not appear to add up. However, any of these discrepancies must be within the precision of the rounding units described above.

Average Annual Percent Change (AAPC) in Cancer Incidence and Mortality

The AAPC values were calculated for each site by fitting a model that assumed a constant rate of change in the ASIRs or ASMRs, that is, a linear model applied to the ASIRs and ASMRs after logarithmic transformation. The estimated slope resulting from that fit was then transformed back to represent a percentage increase or decrease. Data from 1991 to 1998 were used for incidence and from 1991 to 1998 for mortality. These series were long enough to create estimates of AAPCs that were both reliable and current.

Estimates of Non-Melanoma Skin Cancer for 2002 in Canada

The pathology laboratories in British Columbia send all diagnostic reports of non-melanoma skin cancer to the provincial registry. It is assumed that non-melanoma skin cancer is under-reported to some extent. The age- and gender-specific incidence rates in British Columbia for 1985-1994 (in 20-year age groups) have been projected to the current year and applied to the Canadian population estimates to generate a minimal estimate of the number of cases for Canada as a whole. A special study on non-melanoma skin cancer in British Columbia covered this period.

Probability of Developing/Dying from Cancer

Probabilities were calculated based on the age- and gender-specific cancer incidence and mortality rates for Canada in 1998, and life tables based on 1996-1998 all-cause mortality rates. The methodology used was that of Zdeb[33] and Seidman et al.[34] The life table procedures used assumed that the rate of cancer incidence for various age groups in a given chronological period will prevail throughout the future lifetime of a person as he/she advances in age. Since these may not be the rates that will prevail at the time a given age is attained, the probabilities should be regarded only as approximations of the actual ones.

The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 1998. The indicator was calculated by determining the proportion of deaths attributed to specific types of cancer for each gender and age group, multiplying this proportion by the corresponding number of deaths in the life table and summing the life table deaths over all gender and age groups to obtain the probability of dying from each cause.

The Total Number of New Cases or Deaths, Showing the Contribution of Change in Cancer Risk, Population Growth and Change in Population Age-Structure

Figures 2.3 and 2.4 display the determinants of increases in incidence and mortality for males and females respectively. All three series plotted on each graph refer to data from 1971 as the baseline. The upper most series is a plot of the annual Canadian cancer cases/deaths observed or projected. The next to upper most series is an estimate of the cancer events expected if the age distribution of the 1971 population were held constant through time. The next to baseline series is an estimate of the expected number of cases/deaths assuming a population constant in both magnitude and distribution from 1971 to the current year.

In preparation of a more rigorous presentation of how these series were computed, let $P_{i,t}$ represent the gender specific total population in Canada for year t, where i = M for males or i = F for females. That is, $P_{F,1971}$ represents the total 1971 Canadian female population. Next let $ASR_{i,t}$ denote the all cancers, gender specific, age-standardized incidence/mortality rate with reference population being the 1971 Canadian population of

the gender corresponding to i, which is either i = M for males or i = F for females. For example, $ASR_{F,2001}$ is the age-standardized rate for Canadian females in the year 2001.

Upper most series: The annual number of Canadian cancer cases/deaths of gender i for a given year, t say.

Next to upper most: Total population for year t times the age-standardized rate for year t or, in symbols, $P_{i,t}ASR_{i,t}$.

Next to baseline: Total 1971 population times the age-standardized rate for year t or, in symbols, $P_{i,1971}ASR_{i,t}$.

Baseline: The observed number of Canadian cancer cases/deaths for gender i that occurred in 1971.

Potential Years of Life Lost (PYLL)

The indicator was calculated by obtaining deaths for ages <1, 1-4, 5-9, . . . 90+ for Canada in 1998, and life expectancy at the midpoints of the age groups. The PYLL is the total number of years of life lost obtained by multiplying, for each age group, the number of deaths by the life expectancy of survivors.[35]

Population Attributable Risk (PAR)

Population attributable risk (PAR) estimates used in the PYLL calculations were obtained by combining mortality data, smoking prevalence and relative risk estimates by gender, age and disease. Smoking prevalence was estimated using Statistics Canada's General Social Survey,[36] while relative risk estimates were obtained using SAMMEC II.[37]

Smoking-attributable mortality (SAM) was calculated[38] for disease components with known elevated relative risks within the specific disease range. SAM was estimated as the product of the smoking-attributable fraction (SAF) and the number of deaths in each gender, age group, and disease component. SAF was calculated as follows:

$$SAF = ([P_0 + P_1 (RR_1) + P_2 (RR_2)] - 1) / [P_0 + P_1 (RR_1) + P_2 (RR_2)] ,$$

where P_0 , P_1 and P_2 denote never, current and former smoking prevalence respectively, and RR_1 and RR_2 denote relative risk estimates for current and former smokers respectively. PAR was then calculated as the total SAM divided by the total number of deaths for each gender, age, and disease grouping.

Cancer in Young Adults

Cancer incidence for all of Canada was examined for young adults (ages 20-44) from 1969 to 1996. Frequencies were obtained by year of diagnosis, gender, five-year age group at diagnosis and type of cancer for those aged 20-44 at diagnosis. Cancer types for each gender were ranked on the basis of the number of cases diagnosed during the most recent 10-year period, 1987-1996, and the most frequently occurring were included in more detailed analyses. Rates were age-standardized to the 1991 Canadian population. Three-year moving averages are used for the graphical display of time trends. Trends in incidence rates over the 28-year period 1969-1996 were examined graphically for all of Canada by gender for all types of cancer combined, all types affecting both genders, and each of the most common cancer types. Average annual percent change (AAPC) during the most recent decade (1987-1996) was estimated using a linear regression model (as described above), although if the trend over time was non-linear (e.g. quadratic term for "year" was significant [$p < 0.05$]), then AAPC was not estimated.

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